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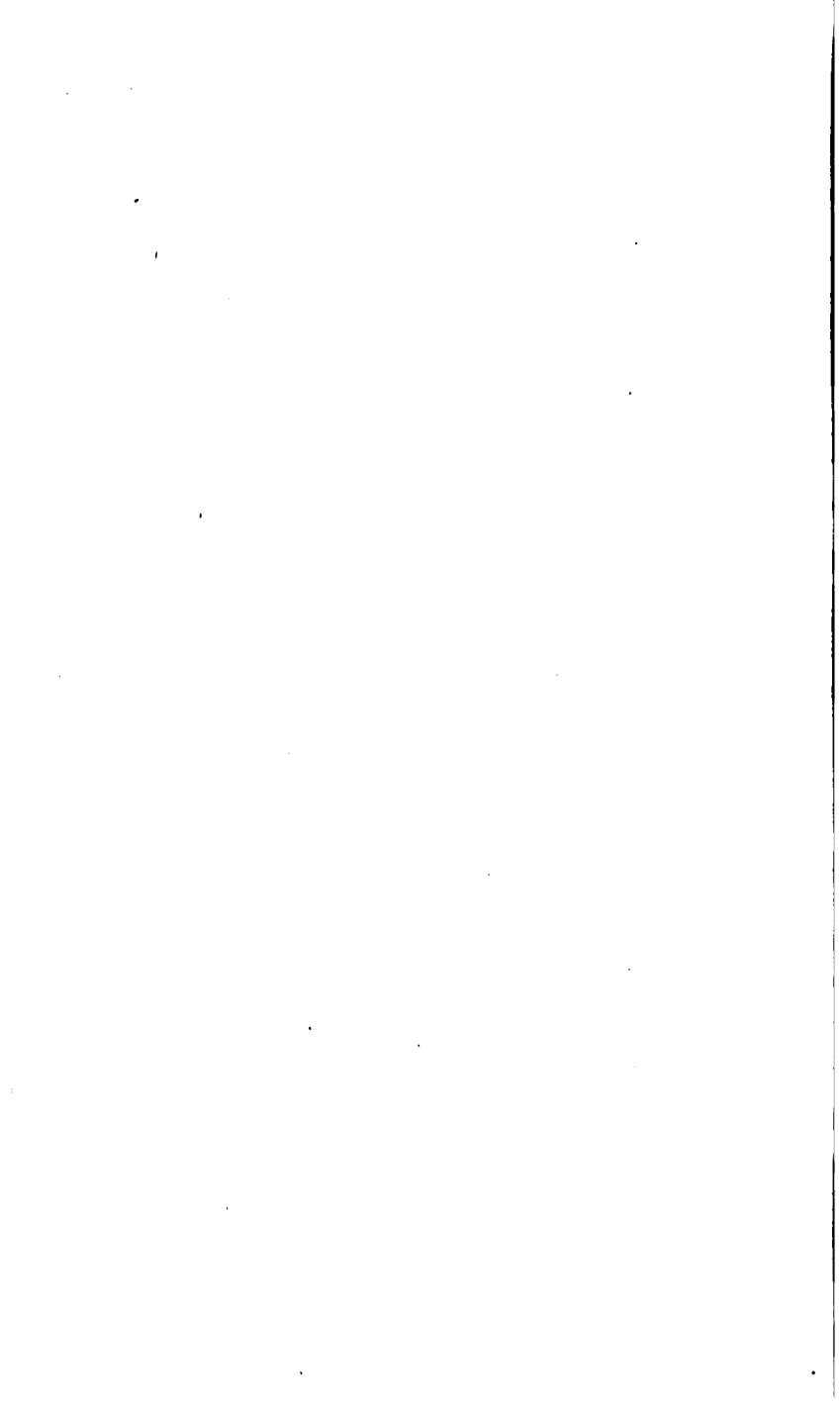




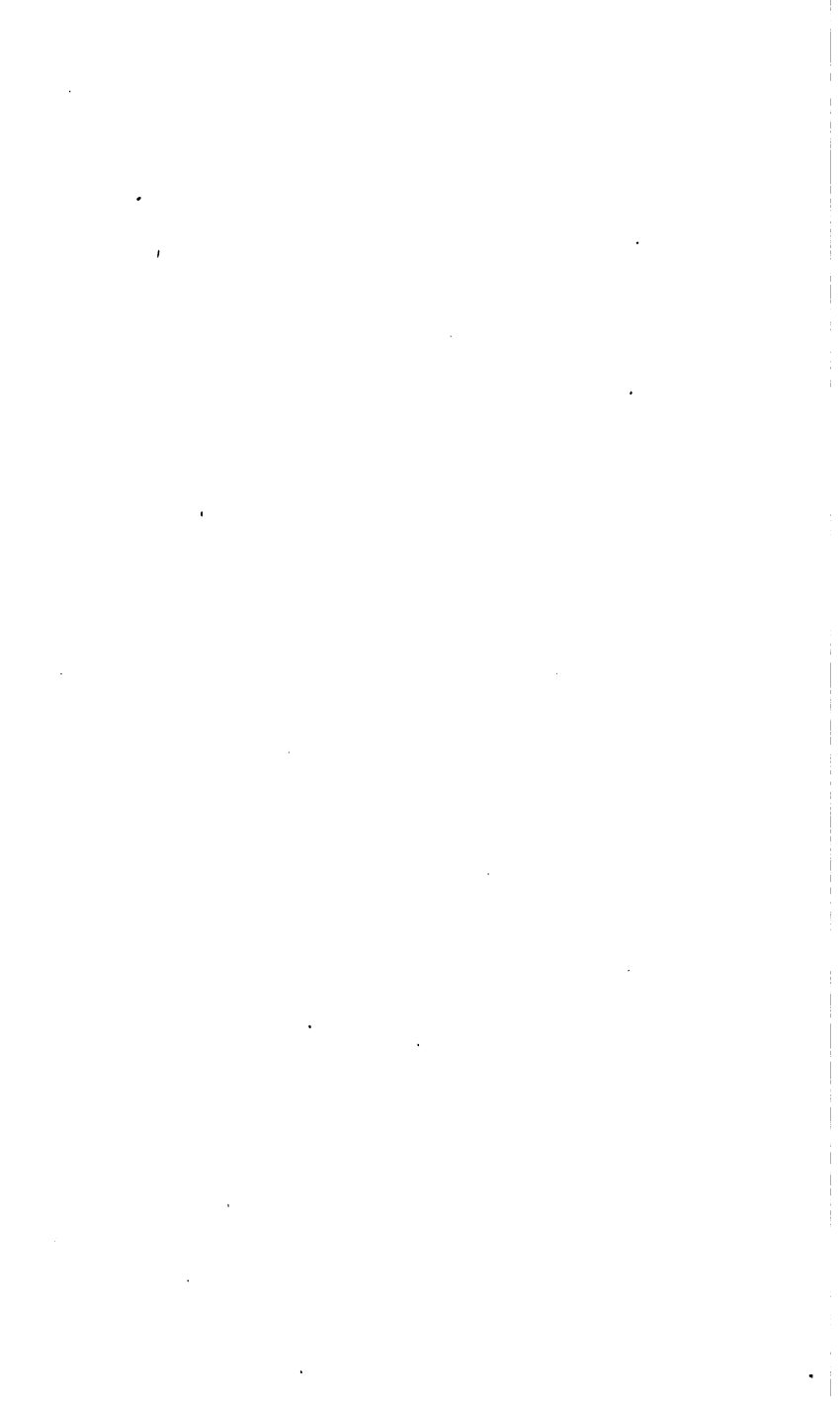
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Progressive Poultry Culture



Progressive Poultry Culture



ARTHUR AMBER BRIGHAM

"The Standard of Progress"

Progressive Poultry Culture

A TEXT-BOOK OF STUDY AND PRACTICE
IN THE KEEPING OF POULTRY FOR
PROFIT AND PLEASURE

By ARTHUR A. BRIGHAM, B. S., Ph. D.

Fifth Edition, Illustrated

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NO. 1000
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FOREWORD

This book was commenced in New England, continued in Maryland, and completed in the Black Hills of South Dakota.

It contains, in condensed form, the results of practice, study, experience, and observation while dwelling in the north, south, east, and west of our great American country, and of experience and investigation during a residence of seven years in Asia and Europe.

In the preparation of the volume there has been a continuous, earnest purpose to lay the foundation for good poultry practice in true, scientific principles.

The treatment of many of the subjects has been influenced by numerous opportunities to study and solve, co-operatively, the particular poultry problems of hundreds of correspondence students located in almost all quarters of the globe.

The valuable results of investigations at several of the state agricultural experiment stations are included in the book. Especial credit should be given for the work of the New York State Station in determining scientific standards for balanced rations of fowls, and for the results of the experiments of the Maine State Station in breeding for egg-production, housing, and methods of feeding.

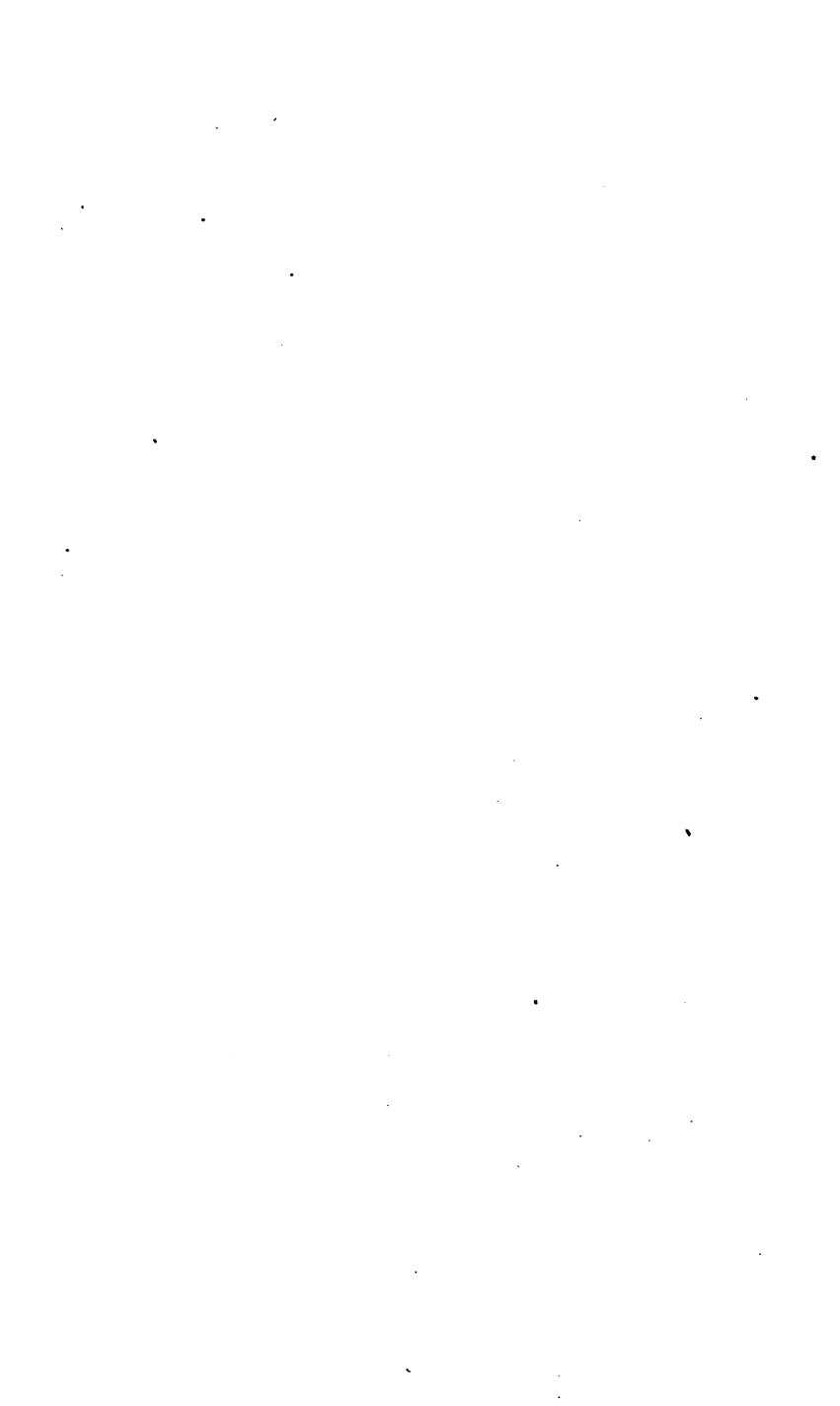
Hearty commendation is here given to Mr. F. H. Stoneburn, a former student of the author, for the execution of excellent drawings of poultry buildings and appliances, used for illustrating several subjects.

Particular mention should be made of the courtesy of Mr. E. E. Richards, editor and publisher of the Western Poultry Journal, in furnishing a number of fine illustrations of typical fowls, the owners of which are given due credit in the text.

This volume will have fulfilled the purpose of its publication if it proves helpful to many practical poultrymen and poultrywomen, beginners and veterans alike, and provides instruction for numerous students of poultry culture in college, school, and home.

ARTHUR A. BRIGHAM.

Brookings, South Dakota.



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PROGRESSIVE POULTRY CULTURE

CHAPTER I

Basis and Beginning of the Business

THE POULTRYMAN'S PERSONALITY.

The first problem in poultry culture is the poultryman himself. The solving of the personal equation is the starting point. It is well to turn one's eyes sharply inward and submit to a searching self examination. An easy start is made if the individual will review his own pedigree, considering the qualities of his parents and grandparents and studying to know what characteristics of his ancestors are decisive parts of his own make-up, and which of these are likely to be conducive or adverse to his success in poultry keeping.

Next he impartially recalls to mind his own history, his habits of thought and action, his varied experiences and the bearing of these indications on his future. He then writes down separately, the inventories of his present qualifications and disqualifications for the calling of the poultryman.

In order that this taking account of stock may be thorough and quite complete, let us consider what these qualities may include.

QUALIFICATIONS OF THE POULTRYMAN.

For the profitable pursuit of the poultry business as a financial undertaking the poultryman should possess the qualities which make the brightest merchant successful. He should be sagacious and shrewd, capable of planning well and executing completely. He should be methodical, having a system developed in all its details. He must be alert, ready to take advantage of

favorable conditions and prompt to prevent mishaps. He will give strict attention to his work, push his plans forward continually, keep accurate accounts and personally know how the business is paying.

Some of the qualities of the old bachelor apply well in poultry keeping. The poultryman should be decided in his ways, have a mind of his own, stick to his purpose and be conservative rather than changeable.

The poultryman may also preempt to advantage several of the characteristics of the old maid; be somewhat fussy, particular as to associates, economical, thrifty and persistent along certain well defined lines.

Then, especially in hatching, brooding and rearing chickens, he should have the mother's ways, being gentle towards the little ones, resourceful in emergencies, patient, cheerful, self-sacrificing, tireless.

When accidents and disease afflict the fowls, the poultry keeper is lacking if he has not some of the wisdom of the grandmother. Her remedies are better than the doctor's drugs to prevent or relieve sickness in the feathered family.

The crowning characteristic of the perfect poultryman is that uncommon quality termed "common sense."

The person who combines, to a reasonable degree, the characteristics enumerated certainly has the making of a successful poultryman.

FAULTS AND FAILINGS.

Characteristics which the poultryman should not possess include the following:

Self-conceit, preventing progress.

Laziness, defeating good intentions.

Negligence, allowing filthiness, parasites and disease to prevail.

Carelessness, nullifying system.

Forgetfulness, omitting duties.

Roughness, disturbing and distressing the fowls.

Unkindness, causing worry and fright in the flocks.

Irregularity, destroying orderliness.

Ignorance is a failing which may be overcome if the poultryman will study and work to gain a full knowledge of the industry.

The lack of some of the desirable qualities of the perfect poultryman is not necessarily crippling if, at the same time, he realizes the lack and has an unconquerable determination to acquire those qualities.

The enthusiast who imagines that he is a paragon of a poultryman, sees himself possessed only of perfections, finds no difficulties in the way and is sanguine of success, will fail.

The man who will stand up before a mirror long enough to look his double in the eyes, ask himself honestly what his feelings are and answer candidly, has placed himself in the right position to begin to develop into a practical poultryman.

If, after a rigid self-examination, one finds that he is decidedly unfitted for the poultryman's occupation and feels that he cannot prepare himself to become a poultryman, it is well. He has saved himself the sorrow of finding it out later after bitter experience and heavy loss.

PREPARATION OF THE POULTRYMAN.

If a person is fairly well endowed with the poultryman's qualities, is intensely interested in poultry keeping and determined to become a successful poultry culturist, the highest success can be won.

Fortunate is the poultryman whose childhood has been spent on a good farm. (The farm is the proper place for growing children.) Good indeed is the outdoor life—the plentiful room, the plentitude to do. Think of the farm pets, the live pets that delight the rural lads and lassies. What a training it is to become acquainted with the domestic animals and how well one learns their characteristics and habits on the farm.

Then comes the common school to lay the foundation right for future study. Advantage may be taken if possible of attendance at a high school and the com-

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ing poultryman need not hesitate to go to college or university if he can. If it is not his privilege to gain the higher education in academic halls, he can nevertheless acquire much knowledge by special study while working to earn his daily bread. Opportunities for



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Courtesy Thos. Peer.

excellent self-education are not lacking. "It is the depth of study and not the extent of it that gives mental power."

The general studies of the poultryman may well

include, if convenient, several branches of science and technology in preparation for his special study of poultry culture.

Biology is the science of life. Anatomy, Physiology, and Veterinary Science are related subjects. The poultryman has to do with living animals. Too much can not be learned of their origin, development, classification, organic parts and functions, means and method of growth, conditions in health, causes and indications of disorder and disease and all that relates to their management as living creatures.

Chemistry treats of the composition of things and of the changes which they undergo. A knowledge of it helps one to better understand foods and feeding, and the processes of digestion, assimilation and nutrition.

Physics deals with the general properties of things and the influences, such as heat, light, electricity, gravitation which modify these properties and daily affect the fowls and their surroundings.

Mechanics has to do with the laws of matter and of motion in the construction of things. Some studying of surveying, mechanical drawing, and carpentering will be of special use in locating the poultry plant, in planning buildings and constructing the same.

These studies give a good foundation to build upon and together with other branches they contribute to the culture of the man and to his preparation for life as a citizen and member of society.

SPECIAL STUDIES.

Having gained a good understanding of the fundamental principles, it is next desirable that the poultryman study certain special things in preparation for his work in poultry culture. Some of these special subjects are the following:—

Principles of Breeding:—It is well to learn what facts underly the proper mating and management of breeding stock, the developing of breeds and varieties and the improvement of fowls.

Factors in Feeding:—A knowledge of the laws of

nutrition, of the proportions of different nutrients in balanced rations and of all the factors that insure successful feeding of poultry, according to the purpose in view, is very desirable.

Incubation and Brooding:—To satisfactorily hatch and raise chickens calls for sharp study of the principles which are involved in incubation and brooding. The relations of life, heat and moisture in these processes are intricate.

Fitting Fowls:—Caponizing, fattening, and fitting the fowls for killing have to be understood in order to secure the best returns in marketing. Properly preparing the birds for exhibition has much to do with winning the premiums and making sales at the poultry shows.

Marketing:—Knowledge and training are necessary in the final operations of killing, dressing and shipping preparatory to selling if financial profit is to be gained.

Accounts and Records:—To know the business aright and keep it under control, the poultryman must learn to keep accurate accounts and for the best development of his birds and his business he should keep records for reference.

Advertising, in these days, is an art and in some branches of poultry keeping it is essential to be a master of this art.

Many other things should be learned and a special course in poultry culture is the best plan for completing the poultryman's preparation for starting in his occupation. "The only hope of understanding is in doing." Accompanying the study by practice will clinch the facts learned. Continued sensible application of the best knowledge makes the poultryman skilful and successful.

Let the poultryman decide to make poultry his life study, using the instruction gained, profiting by the experiences of other poultrymen, acquiring wisdom from his own successes and failures and always welcoming any new practical ideas which will help on his poultry progress.

Poultry culture is a vocation which gives ample opportunity for the deepest study, unlimited play for the best talents and abundant room for the most skillful practice. The poultryman of to-day, who is equipped with a natural inclination for the calling, interested in the industry, trained in all the care and management of the fowls, especially educated for this business and not afraid to work hard with both brain and brawn, is prepared to act with intelligence and may become not only a successful breeder of thoroughbred poultry but also a public benefactor and an honor to his state and country.

BUSINESS BASIS.

The basic factors of the poultry business are those underlying every other genuine business: Land, Capital and Labor.

Land:—There must be a place for the industry, whatever its size. Unfortunate is the flock that has not plenty of land. Disorders and diseases often result if the space allowed is too confined. If the fowls do not require all the land available the extra area may well be used for growing crops to supply food for the fowls.

Capital:—The funds used in establishing and maintaining a business are included in two classes. Fixed capital is invested in land, buildings, fences, roads, drains, water-works and any permanent improvements. Floating capital is applied in the purchase of fowls, tools, feed-stuffs, supplies and running expenses. It moves from one thing to another and is more easily converted into cash than the capital sunk in fixtures. The fixed capital does not yield a direct income and the floating capital must therefore be made to bring returns for itself and earn interest on the fixed investments.

Here is the financial reason for limiting the area of land to actual needs, for economy in buildings and for avoiding expenditure for ornamental purposes to any great extent, also for purchasing or using for poultry keeping only land that is reasonable in cost.

Further it is very desirable that the poultryman should not expend all of his money as fixed capital. This would cripple him at the start. His working capital should be ample for its purposes, enabling him to purchase supplies in large quantities for cash, at lowest rates, on the best terms and placing him in a position to take advantage of any condition of the market favorable to his plans.

When the poultryman is tempted to invest more than one-half of his available funds as fixed capital he should hesitate and usually halt. A floating capital equal in amount to the fixed capital signifies an intensive, progressive poultry business. The moveable money is kept going and should return often with increase, which means profit.

Labor:—Work is what usually decides, more than any other factor, the degree of success and profit in poultry farming. If it is truly economical labor and effectively directed, good results should follow.

A poultry business may be started on labor alone. For example, a farmer boy agrees to work for his father, or some other employer, and to take payment in fowls. For more of his labor he obtains the use or ownership of sufficient land on which to keep his poultry. For yet more work he secures a building or materials for making one. He gets feed and other supplies in exchange for further work. By his own efforts he arranges a home for his flock and cares for the fowls. He gets money for eggs and chickens and this capital is used to buy more fowls and to increase the business in other ways. His labor has really produced capital, which is represented by the land, buildings, fowls and supplies of which he is the owner. This is a slow way of establishing a poultry plant but it is a safe plan and successful. It is better than beginning big and ending small.

Head-work is one kind of labor that pays well in any undertaking. If the poultryman's brains are of good quality and sufficiently exercised in thinking and studying over the details of his business, there will be

few costly errors in management, capital will be used with economy but not with parsimony, and work will be reduced to the minimum by convenient arrangements and labor-saving appliances.

It takes time to build up a poultry business to successful, profitable condition, but it can be done by the poultryman having the right character, making the correct combination of the foundation factors—suitable location, sufficient capital, systematized labor—beginning on a small scale, increasing and enlarging gradually, profiting by experience in the local conditions, interested and earnest in pushing progressively onward, preventing leaks and wastes and continually bending mind and muscle to the work.

ADVANTAGES AND DISADVANTAGES OF POULTRY KEEPING.

Attractiveness:—Poultry culture has peculiar and particular attractions. Few indeed are the persons who do not show interest in the beautiful and useful farm fowls. The breeding, raising and managing of the birds is an occupation enjoyed by people of both sexes and of almost all ages. It offers ample opportunity for the abundant exercise of both brains and muscles by men and women of almost all conditions of life. Oftentimes the boys and girls, especially on the farms, take up the work of caring for the fowls and find it so pleasant and profitable that they are saved from the allurements of the city and become satisfied to follow rural pursuits for life.

The fowls are the friends alike of the rich and the poor. Many business and professional men take up poultry culture as a recreation and find profit as well as pleasure in their hobby.

The birds are interesting because they have life and liveliness, because they respond promptly and generously to good care and management, because they are of beautiful plumage, symmetrical shape, graceful carriage, wonderful activity and great usefulness.

Easy Beginning:—The beginning in poultry keeping can be and ought to be modest and the growth of the

business should be gradual. This signifies small capital to start with and increase of investment according to experience. A small flock and little land will enable one to commence in the industry.

Prompt Returns:—The income from the investment begins to come quickly, because eggs and chickens are soon produced and are readily sold at any time for cash.

The Products:—Live fowls, dressed poultry, eggs and feathers are in constant and increasing demand. Wild fowls and other game are vanishing, the prices of meats of all kinds are advancing and new uses are developing in the arts for some poultry products. Dressed fowls and eggs are concentrated and perishable products which are valuable enough to stand considerable expense for prompt transportation in fresh condition to cash customers.

Enrichment of Land:—The droppings of the fowls are a rich fertilizer and especially valuable for use in the garden or orchard, for the lawn or grass lands and for forage crops and foliage plants.

Utilizing Wastes:—Many of the wastes and by-products of the household and farm are utilized by the fowls and changed into valuable poultry products.

Healthfulness:—Poultry keeping is a decidedly healthful occupation. So much so in fact that it is frequently taken up by persons not in the best of health and sometimes with very beneficial results.

Disadvantages:—Sometimes the poultry occupation demands more hard work and sacrifice than is agreeable. Epidemic diseases will occasionally cause destruction of the living creatures in spite of every precaution.

IMPORTANCE OF THE CALLING.

Statistical Studies:—Few people realize the extent of the poultry business in the world. It is well for the poultryman to consider some of the evidences of the importance of his calling.

Statistics are dry things, but sometimes they show results that are a revelation to the uninitiated. According to the already somewhat ancient reports of the twelfth census, the value of the annual poultry products of the United States of America was close to \$300,000,000 at the end of the nineteenth century. Of the 5,739,657 farms of the country nearly ninety per cent. included poultry keeping as a part of their industry.

There was 57.8% reported increase in the production of eggs in the years from 1890 to 1900 and yet the average reported number of eggs laid per fowl was only 5.6 dozens for the year ending the decade and closing the century. This shows that there is room for improvement. The average reported value of eggs per dozen was 11.2 cents, not quite one cent a piece. Here again is opportunity for something higher.

The number of common domestic fowl, three months old and over, and of Guinea fowl, turkeys, geese and ducks, kept on the more than five million farms and ranges, on June 1, 1900, was 250,681,988, and these figures do not include the flocks kept in towns and on village lots.

Considering the immense number of fowls and the enormous reported value of their annual products in this country alone, compels us to realize that statistics are staggering. What then shall we conclude as to the numbers of domestic fowl and their yearly yield in the whole world?

Further Evidences:—While the bulk of the eggs and dressed poultry and feathers for home use and for market, comes mainly from the farms, there is yet further striking evidence of the growing importance of poultry in the development of the industry as a special business. Capitalists have found it worth while, in many cases, to invest large amounts of money in extensive poultry plants. Poultry farms to-day are not a rarity. Intensive poultry practice is an established fact.

Consider the crowds of collectors and carriers of

poultry products; the multitude of men who prepare poultry for market and the army of packers, shippers and distributors of poultry products. The express companies, railways, steamboats and other transportation agencies do an enormous and very profitable business as carriers of poultry and poultry productions. The rapid methods of modern transportation have revolutionized poultry keeping as an industry. The limitations of the local demand have little influence on the supply. A large surplus of eggs, fowls or feathers in any locality is quickly shipped to other points where there is demand for them or sent to storage houses for preservation until wanted.

The great city markets, where dressed poultry and eggs are on sale, show in an interesting and convincing manner the importance and popularity of poultry products as food for the people. Probably, however, one-half of the total product of the flocks is consumed in the homes of the producers.

The extent of the poultry industry is also indicated by the present development of allied branches of business, such as the manufacture and sale of incubators, brooders, trap-nests, shipping and exhibition coops, portable hen houses, furnishings, poultry fences, shell, grits, caponizing instruments, etc. There are more than one hundred different kinds of incubators and brooders made.

The extensive advertisements of poultry supplies and appliances are an emphatic indication of the size of the business.

The number, size and activity of the poultry associations and specialty clubs bear witness to the interest taken in pure-bred fowls. The poultry exhibitions offer numberless striking object lessons as to the multitudes of fanciers and their flocks.

The poultry books published, the poultry bulletins issued by the United States government and state experiment stations and the host of poultry periodicals published show something of the importance of the poultry industry.

Special poultry schools, poultry courses in the agri-

cultural colleges and state universities and poultry lectures at farmers' institutes and other public meetings are an interesting index of the progress of poultry husbandry.

PURPOSE AND PLAN OF POULTRY PRODUCTION.

Broadly stated, the purpose in poultry keeping is profit or pleasure or both. The general purpose may lead to the development of a special purpose and plan of production such as the raising of a particular poultry product to supply a special demand. The great variety of poultry products obtainable makes it easy to select one or more as specialties, for examples:—fresh eggs, squab broilers, soft roasters, newly hatched chicks, etc., etc.

A great deal has been written about beauty and utility as distinct lines in poultry culture but most breeders are glad to unite both of these qualities in their flocks.

The different purposes and methods in poultry keeping may be considered under four heads:

1. *The Family Flock*:—Numerous indeed are the little flocks of fowls kept by families having only limited room for poultry or caring only to have a few chickens on the place.

The main purpose is to have a certain and continuous supply of fresh, wholesome, palatable poultry products for the family table, secured at small expense. The food of the fowls is mostly furnished by the wastes of the household, supplemented, perhaps, by the surplus crops of the garden. The care of the flock takes but little of the time of some member of the family and the whole arrangement may be very simple and economical.

Domestic fowls lend themselves to the successful carrying out of this plan with easy adaptation to conditions and thus contribute to healthy, inexpensive living in many homes.

One of the strong inducements in the modern move-

ment of city dwellers towards suburban homes is found in the possibility of having a nice flock of fowls.

An attractive hen house with neatly fenced yards, enclosing a small flock of select fowls is no mean addition to any home place.

2. *The Farm Flock*:—The object of keeping hens and raising chickens on the farm is usually to secure fresh eggs and dressed fowls for home use and for market.

Someone on every farm is, or ought to be, interested in the farm fowls. By the usual plan, or lack of plan, the hens have to take care of themselves and consequently they yield only small returns. Too often they are housed in some unsuitable shed or out-building or barn when darkness or storms keep them from roaming at will over the premises.

The birds are, perhaps, only mongrels or scrubs which the farmer rightly regards as a nuisance on the place. Once in a while he may seek to improve them by bringing in fresh blood in the form of a new cockerel. About the only visible effect of this spasmodic scheme is to add yet greater variety to the rain-bow hues of the wonderfully variegated flock.

When the farmer's wife or boy becomes interested in the chickens there is cause to hope for their future. Sometimes the flock, in careful hands, proves to be the most profitable part of the farm live stock. The farmer, awakened by this object lesson, becomes interested himself and supplies the desired support for bettering the conditions and extending the poultry industry on his farm. Instead of allowing the birds to wander everywhere and foul everything with their droppings, a place is provided for them and they are kept within proper bounds.

If a woman has to care for the farm fowls, it is well to have the hen house within easy reach of the dwelling house and large yards enclosed by good fences should be provided for them.

If a man or lusty lad manages the flocks, an excel-

lent plan is to have small colony houses placed in a pasture far enough from the farmstead to prevent the birds trespassing in the garden or on the grounds near the buildings.

The mongrel fowls can be improved by breeding the



Courtesy Aug. D. Arnold.

best of them with males of one pure breed adapted to the purpose of the farm poultryman. Very soon the mongrels will be disposed of and a flock of pure-bred

fowls started, because the latter are far more profitable in every way than the scrubs.

There will also be improvement in the selling of the products. Instead of taking miscellaneous lots of eggs to the store occasionally, and accepting pay in trade, arrangements will be made to deliver the eggs fresh and clean at regular times to cash customers. The chickens, instead of being sold alive to hucksters at lowest prices, are dressed neatly and delivered promptly on orders.

Oftentimes there is developed considerable business in the sale of eggs for hatching and surplus stock for breeding purposes. Thus the farm poultryman begins to be a fancier.

3. *The Financier's Flock*:—The purpose of the proprietor of a large poultry business is mainly financial profit, though sometimes pleasure or glory is desired. The plan is specialization and intensification which, applied to certain branches of business, is one of the most striking modern methods of securing success.

Men of means and experience in poultry culture have established large poultry farms which are devoted exclusively to this intensive form of farming.

Wealthy men, lacking experience in the poultry business, have also invested capital ill-advisedly, often lavishly, in elaborate poultry plants and these have proved foolish failures.

Success on large poultry farms has been due to business sagacity, sufficient capital, systematic methods, well directed labor, careful accounting, progressive pushing. Failures on large poultry plants have resulted from mistakes in location, faulty buildings, ill proportion between fixed and floating capital, ignorance, mismanagement, wastes. Some persons seem not to have realized, until compelled to by sad experience, that the causes of failure in the poultry business are the same as those which bring disaster in any other business.

4. *The Fancier's Flock*:—The purpose of the fancier is sometimes just joy and recreation, but usually he has an eye to profit.

Breeding fancy fowls is artistic agriculture whether carried on in city, town, village or rural home. Keeping the beautiful birds is the poetry of poultry production.

Every one should have a hobby and ride it hard. When the choice falls on pure-bred fowls they and their possessor ought to be satisfied. The best qualities of the man are brought to the fore by the thinking, studying and working necessary to manipulate the natural forces involved in producing the beautiful plumage, attractive appendages, and symmetrical shapeliness of his thoroughbreds.

The fancier sets high before him a standard of perfection and strives to bring his fowls up to it. His best birds are exhibited in competition with other fine bred birds at the poultry shows and prizes are the reward of the most successful breeding.

Some fanciers do not send their birds to exhibitions but keep them for pastime, or for the sake of their superior products.

Usually fanciers select and seek to improve fowls of some well established breed. Sometimes they take up new breeds and occasionally a fancier seeks to develop a new variety.

Poultry fanciers in many countries have their national associations and the breeders of favorite varieties of fowls unite in specialty clubs.

The most successful fanciers have started with but few birds and have bred for quality rather than quantity of their feathered pets. They have proved that neither large area nor great capital is necessary to success.

Great financial gain has been the reward of the earnest work of some breeders of fancy fowls.

Progress in poultry culture along both fancy and utility lines has resulted from the splendid work of brainy breeders of thoroughbred fowls.

Fowls left to shift for themselves tend to become less and less beautiful and useful. Human interest and earnestness are necessary to counteract this tendency.

26 **PROGRESSIVE POULTRY CULTURE**

By careful selection, proper mating and skilful management the best traits of the breed are retained and increased in excellence. Even new and valuable qualities may be developed and fixed in the fowls. The effect for improvement on the world's numberless flocks should be large and lasting.



S. C. BROWN LEGHORNS

Courtesy W. G. Warnock

CHAPTER II

The Principles and Practice of Poultry Breeding

Selection is the key to successful and satisfactory breeding of poultry. In order to make proper selections, in breeding domestic fowls for his purposes, the poultryman should have a thorough understanding of the underlying facts and exercise his brain powers to the fullest extent possible. His knowledge should extend to all of the influences and conditions affecting the breeding of the birds.

THE FACTORS IN POULTRY BREEDING.

The numerous influences involved in the propagating of fowls may all be included in three groups: first those relating to Inheritance; second, those which constitute Environment; third, those which are the result of Exercise of Functions.

1. *Inheritance* or Heredity includes all the powers, qualities and characteristics which the parents transmit to the offspring through the germ-cell of the egg. The germ-cell in a hen's egg is easily observed if one will gently make an opening through the shell, about midway on one side of the egg, and then hold the egg with this opening uppermost. The yolk of the egg floats to the top and carries, imbedded in its upper surface, a whitish circular spot about one-eighth of an inch in diameter. This spot is the germ-cell, which in a fertile egg, subjected to the influences of incubation, develops as an embryo and, if all goes well, hatches into a live chick. Wonderful indeed is the working of this law of life, which insures the conveyance of the combined or mingled qualities of the hen that laid the egg and of the male bird that mated with her, to the little chick hatched from the egg.

This powerful influence of inheritance extends to

the size and shape of body and of the different body-parts, to the coloration of the feathers, to the capabilities of the digestive system, to the capacity of the breathing apparatus, to the heart-development, to the quality of the bones and muscles, to the keenness of vision, to the texture of the comb and wattles, to the foldings of the brain. It affects the new creature's bodily strength or weakness, its possible length of life, its breeding powers (egg-production) and even the chicken's disposition and habits. Unfortunately poor or bad qualities are inherited as readily as good ones.

Disease is not directly transmitted but conditions inviting or favoring the development of disease-germs in the body may be inherited. For example the bird which has by inheritance, weak lungs or poor digestive powers is very likely to succumb to disease attacking these parts of the body at some period in its life.

This hereditary influence of the parents has much to do with the start in life not only of the fowls but also of the poultryman himself, for these facts apply to the human family as well as to our feathered pets.

The laws of inheritance hold the animal kingdom to an orderly, systematic development and procession. The poultryman is thereby assured of regularity in the results of his matings of fine fowls. The eggs of these birds will certainly produce their kind and not hatch into sheep or swine or snakes. Nature is not fickle and as a rule she forbids the formation of freaks.

2. *Environment.* As soon as an egg begins to be incubated, influences surround it which are very different from those of the group just considered. Inheritance acts from within and we wonder at the power of these life influences enclosed within a minute cell. Other influences, however, act upon the embryo from the outside. Temperature, moisture, air all affect the growth of the embryo chick in the incubating egg. After hatching, these surrounding influences increase and become more potent in the life of the chick. Shelter, food and all that is signified by the domestication and

care of the fowls have much to do with their welfare and future usefulness as breeding stock. Summed up, these surrounding influences should result in continual comfort for the fowls.

Conditions of environment causing discomfort are sure to check the development and growth and result in impaired breeding quality. Unhealthy surrounding conditions may induce disease and destroy breeding power.

Much, therefore, depends upon the selection and maintenance of right conditions of environment for poultry. Here is ample opportunity for the poultry breeder to exert his power, for most of the surrounding conditions are under his control. Suppose, for example, that he has fifty little chicks which he is rearing in a brooder. If he selects and maintains for them a continuous comfortable temperature, other conditions being also favorable, the chicks grow thriftily and bring both pleasure and profit to their owner. If, however, the other conditions remaining favorable, he, by carelessness or accident, permits the chicks to get chilled, this one item of the environment being wrong, trouble begins, digestive disorder very likely follows, growth is checked or halted, many of the chicks die and those remaining alive do not prosper.

The food might not, at first thought, seem to be one of the conditions of environment. It does not surround the fowl, rather the fowl surrounds it. Consider, however, that the digestive tract is really a long tube extending through the bird's body. It has a lining or skin on the inside. The organs and parts of the bird really lie between this inner skin and the outer skin of the body. Even the food in the digestive canal may be considered as outside of the vital parts of the animal, i. e. separated from them by the lining of the canal. Certainly nothing should be allowed to come in contact with the outside or inside lining of the bird which would inflict injury.

One of the most important items of environment is the food, which should be wholesome, healthful,

nourishing and supplied in properly balanced rations. Domestic fowls are almost entirely dependent upon the poultryman for their food supply in respect to both quality and quantity and this is one of his most important means of influence in the management of his breeding stock.

3. *Exercise of Functions.* As soon as the chick develops organs for blood circulation, food digestion and muscles for moving, there comes into play another set of influences in the life of the creature. It begins to use its powers and the exercise of the parts tends to increase their strength and capacity. Healthy, natural exercise of the functions of the bird's body tends to the best development and maintenance of these functions. Excessive use or abuse of any of these powers tends to react disastrously upon the functions and upon the bird's whole organism. This matter is very largely within the control of the poultry breeder. For example he may, by early hatching and high feeding, cause his pullets to develop rapidly, and begin laying while still quite young. The eggs of these precocious pullets will be found lacking in hatching quality to a considerable degree if the attempt is made to incubate them. If some of the eggs yield chicks they will usually prove to be weaklings. Moreover the pullets, after laying a while, will very likely begin to molt and delay further egg-production until the following spring, the natural nesting time of the birds. Thus even in a commercial way, the pullets prove the futility of the poultryman's plan for forcing egg-production at the expense of the development of the other functions.

Again the poultryman may, by close confinement of his adult fowls and by too generous a diet, especially of Indian corn, induce habits of laziness in his flock. The fowls lay on fat, their eggs become infertile, later egg-laying stops altogether, the birds stand about in idleness, they get listless, their systems become clogged, they topple over and die of apoplexy. An entirely different result is secured simply by compelling the hens

to take bodily exercise. By making them scratch for at least a part of their living, the circulation of the blood is increased, digestion is improved, there is flesh formation in place of fat deposition and active operation of all the bodily functions. The fowls are lively, sprightly and healthy. Their eggs prove to be fertile and yield chicks which are vigorous, thrifty growers.

CO-OPERATION OF INFLUENCES.

The influences of the three great groups do not act separately and independently in the development, growth and breeding of the fowls. Rather are they commingled and combined in their action so that it is very difficult and oftentimes impossible to determine just what influences have produced certain results in the animal organism.

Evidently there are some influences that the poultryman cannot control and others which are only partially under his command, but there remain many conditions which are entirely within his power to regulate. His part in the breeding of the beautiful and useful birds is to exercise his power of selection as applied first to the parent birds which are the medium of hereditary influences, second to the surrounding conditions of the breeding stock and the progeny and third to the management of the fowls in the use of their functions and productive powers.

Considering what a multitude of agencies are co-operating in the breeding and growing of a chicken, the poultry breeder is compelled to acknowledge that he can never know these factors too well if he is to learn to manage them successfully for producing perfect poultry.

Many men have given earnest thought and careful study to the problems of stock-breeding. Some of the facts developed in the experience of breeders of domestic animals in the past, are stated in the following brief explanations of what are sometimes termed

THE PRINCIPLES OF BREEDING.

Heredity. Only a little experience in breeding poultry is sufficient to convince the breeder that heredity both helps and hinders his operations. He learns in a very practical way that he has to reckon with the certainty of the inheritance of faults as well as desirable qualities of parents by the offspring.

Heredity has been defined as "the inheritance by the offspring of the characters of the parents, at the time of procreation." The parents repeat themselves in their descendants.

Of all the qualities of the parents transmitted to their offspring a portion only are apparent to our senses. Other characteristics are not so evident or escape our means of observation.

To explain the degrees of conspicuousness of parental characteristics in the offspring two terms have been used — *dominant* and *latent*. Dominant characters are those which are very apparent in the offspring. Latent characters are such as apparently disappear, become obscured or hidden from our observation. Dominant characters in one generation may become latent in the offspring of a later generation. Latent characters may reappear after one or more generations, sometimes becoming dominant.

In the mingling of the parental qualities in different offspring of the same parentage, there is never the same arrangement of dominant and latent characters. No two chicks of the same parentage are exactly alike. There is a rearrangement each time, which brings out qualities more or less dominant or conspicuous and the combination gives to each offspring its own individuality.

Atavism. If characters become dominant which were latent in the parents but apparent in a previous generation there is said to be a reversion or "throwing back." The offspring inherits through the parents some evident characteristic quality of a grandparent or of some more ancient ancestor. The scientific term of

this form of Heredity is Atavism (from a Latin word meaning ancestor).

Here is one of the dangers of the ambitious poultry breeder. He seeks to make rapid progress. He wishes to advance continuously and swiftly in perfecting his pets. He makes matings of birds uniting the characteristics which he most desires to develop in his chicks. In so doing he, perhaps, brings together birds possessing some strong opposing characteristics. Instead of commingling their characters to produce the desired composite chick their dominant characters disappear and a long latent character of the original type of the breed or of some almost forgotten ancestor becomes dominant in the progeny.

The cautious, careful, conservative poultry breeder makes haste slowly and avoids these breaks in breeding which arise because of the action of Atavism.

Prepotency. The poultryman who patiently persists in selecting and mating together his very best birds, with the definite and decided purpose to improve certain characteristics, finds that, instead of throwing back, the offspring strike forward. Pairing together two fowls of like good quality, if they do not possess antagonistic qualities or powers, usually insures the development of the good quality in the offspring to a greater degree than was apparent in either of the parents.

By mating together birds of similar excellent qualities the power of transmitting those qualities also is usually increased. By continuing this process generation after generation, in a strain of fowls, the valuable quality becomes more and more a distinguishing characteristic of the family.

In pursuing such a policy, there are sure to arise among the progeny, individual birds, which not only possess the desirable good quality but also show increased and certain power of transmitting the quality to their get. They are *prepotent*, i. e. very powerful in this respect. Such special, emphatic power is a very valuable possession and the poultryman should cherish

such birds as of more than usual value in his breeding pens.

A prepotent male or female fowl may transmit prepotent quality to successive generations and numerous descendents so that, in the course of time, it becomes the leading characteristic of a variety or breed of poultry.

Prepotency in the transmission of certain valuable characters is the quality which causes pure-bred male birds to be purchased so extensively for use in crossing upon common farm fowls for the improvement of the latter.

Because a bird is pure-bred, however, one should not conclude that it is necessarily and always prepotent. There are degrees in prepotency. More than one bird of good pedigree has proved that its family characteristic of prepotency may become latent. Actual testing of a bird by use in breeding, will alone decide what degree of prepotency is possessed. When a bird is found to be especially prepotent in transmitting to progeny a certain desirable quality, such as large egg-production, rapid growth, early maturity, easy fattening, typical plumage, etc., such bird should be carefully controlled and kept for breeding as long as practically possible. The possession of a very useful quality and of prepotency in its transmission to offspring is the most valuable combination in poultry breeding.

Correlation. It is possible to develop the prepotency of a prominent quality to excess. For example, rapid and long continued egg-production may be so encouraged that the bird bends all her energies to the exercise of this function, becomes unbalanced and exhausts her vital powers to such an extent that death ensues. On the other hand early maturity and the fattening quality may become so developed in a strain of fowls that the breeding powers are eclipsed, the internal organs become coated with fat, globules of fat replace the egg-clusters in the ovary and fatty degeneration goes on until the heart fails and the end comes. Thus if the exercise of one function is pushed to the

extreme other functions are liable to become impaired. The different parts of the bird's body are not independent of each other. There is an interdependency, a relationship together among the body-organs. This is expressed as Correlation of Parts. Strict attention to this fact is necessary in order to sustain the proper balance of the parts and maintain a natural, healthy co-operation of the functions of the fowl.

The correlations of the different parts of the body are not equal. Certain organs are more closely related together than others. The dependence of the organs of blood circulation upon the digestive system is evident and the relation of the blood circulation to all the parts of the body in their process of growth, repair and production need not be emphasized. There are also correlations which, if carefully studied out by the poultryman, enable him to judge of certain inward parts or functions by the appearance of correlated outward or visible parts. The most common illustration of this fact is found in the striking fullness and redness of the combs and wattles of a cockerel in the full exercise of his powers during the breeding season as compared with the head appendages of a capon. The shrunk, insignificant, pale comb of the caponized bird testifies to the loss of breeding power in a very decided manner. Much the same difference of appearance is noticed between a pullet that is laying well and a hen that is in the molt.

The poultryman who would learn at first hand, all that he can of the correlations of parts in fowls, will scrutinize frequently the outward appearance of his birds and whenever he kills a fowl will observe the appearance of the internal parts as to size, development and condition. Studying thus the organs themselves and searching out their relationships he will come to know from the outward conditions what are the inward conditions of his birds both in health and disease.

Variation. Although we try to breed our birds to a standard type and strive to get them as like as peas

in a pod, yet no two birds are ever exactly alike. That is one thing that makes them interesting. In each there is a somewhat different arrangement of the dominant and latent qualities so that we recognize individuality.

If the parent birds produced chickens which at maturity, would be just like themselves and all alike among themselves there would be an end of improvement. Fortunately for the enterprising and progressive poultry breeder, all the birds of one breed or even of one family are not cast in exactly the same mold. Although the general characteristics of the parents are inherited yet there are often decided variations in the offspring. Some of these are explainable by Atavism but others and especially such as indicate improvement in qualities of use to the poultryman, are brought about by conditions of Environment and Exercise which are largely within the control of the breeder.

When animals are brought into surroundings differing from those of their previous environment, they sometimes find themselves not fully adapted to the new conditions. If changes in themselves are necessary in order to exist under the circumstances, they yield or try to yield to the influences. Variations result in their organisms or in their offspring which better adapt them to live under the changed conditions.

Domestic birds yield more readily than wild birds to the influences tending to cause variation.

The causes of variations more or less within the controlling power of the poultryman include those of climate, nourishment and exercise.

By a careful selection and combination of influences steadily continued in their application, the birds, in some cases and after a time, are induced to vary. By keeping the conditions constant long enough the variation becomes a fixed characteristic of individuals. Then by selection of the individuals which show the desired variation most decidedly, and breeding from them, certain variations at least appear to become transmissible by inheritance.

It is thus that the poultryman, calling to his aid all of the influences of Environment, Exercise and Heredity that he can, seeks to develop a strain or family of fowls that will lay eggs out of season and yield many more eggs than usually are produced. It is considerable of a step in variation for a fowl to lay ten dozens of eggs instead of one or two dozens in a year and some further variation has taken place when the fowl lays over two hundred eggs annually.

It has taken a long time to produce the variations expressed by the many breeds and varieties of domestic fowls existing to-day which originally came from the little wild jungle fowl of India.

Variation may operate against the desires of the poultryman bringing him disappointment rather than delight. His birds may deteriorate rather than improve in useful traits, especially if, through his carelessness or ignorance, the surroundings of his flock are unfavorable. Such influences tend to cause variations which detract from the profits of poultry keeping although they may enable the fowls themselves to survive rather than succumb to their environment.

Climate. Temperature influences the fowls and gradually causes variation. Warmth and consequent comfort, resulting from proper shelter or a congenial climate, encourages breeding and hence tends to increase of numbers. Cold weather has an opposite effect, tending to prevent or postpone propagation. Here is an important reason why hens hesitate to lay eggs in winter. Egg-laying is an act of breeding. Each egg is intended to produce a chick. When coldness causes discomfort to the fowl it stops breeding operations and devotes its energies to gaining body comfort. The blood instead of going to manufacture eggs, furnishes more fuel to keep up the body temperature.

When coldness and dampness both afflict the fowls and lack of ventilation cuts off the liberal supply of oxygen, the combination of evil influences is usually fatal. A new hen-house, tightly built, not properly dried out and unventilated, has often provided a calamitous

climate for fine fowls. Pullets just ready to lay, placed in such environment in the autumn will catch cold, lose condition and very likely become sick with that dread disease—the roup. Even if this disgusting disease does not prove fatal it causes decided deterioration in the breeding quality of the birds.

A change of location from a mild climate to a severely cold climate tends to induce disorders of the lining membranes of the mouth, throat and bronchial tubes.

Changing from a low level to a greatly elevated location may induce lung trouble. The atmosphere of the high hills is thinner than that of the lowlands. To secure the usual quantity of oxygen for oxydizing the blood, the lungs must take in more air and work faster. This may cause distress or disorder of the lungs for the birds brought to the new location, but they seek to adapt themselves to the condition and in successive generations the size of the lungs and the chest cavity is increased. Changing from high land to low land is likely to cause congestion of the lungs because the air being heavier and having more oxygen than the thinner air of the heights, overloads and overworks the breathing apparatus.

Cold weather calls for increased body-heat which is supplied by extra food. There is increase of appetite, more active digestion and assimilation of nourishment and a tendency to fatten.

Nutriments. Climate may thus be united with food in causing effects which if long continued often result in variation.

Abundance of food tends to encourage breeding, especially if the climatic conditions are comfortable.

Nutriments of a nitrogenous and phosphatic nature helps to develop early maturity and flesh formation.

Fatty and starchy foods favor fattening.

Exercise. The regular exercise of the body-parts has large influence on the form and development of these parts.

The exercise of a function largely determines its

producing capacity. Excessive use or abuse of an organ may result in impairment or impotence. This fact applies to the generative organs and is one of the explanations of chicks dying in the shell. Frequently the female fowl is forced to excessive egg-production or the male bird is mated to numerous females or both of these conditions occur together, and the wonder is that any of the eggs hatch or that any of the chicks live.

Direct and sudden variations of fowls may be caused artificially. For example, a bone of the body may be broken or a part of a wing removed by accident. Such variations from the normal condition are not transmitted from parent to offspring.

Game birds that are bred for fighting usually have the comb and wattles "dubbed" i. e. trimmed, and the process is repeated generation after generation but the birds never transmit the mutilated condition to their chicks.

IN-BREEDING. LINE BREEDING.

The breeding together of birds of close blood-relationship is termed in-breeding. Every fine flock of fowls contains a best male and a best female bird, whatever may be the standard according to which they are selected. Pairing these two birds, particularly if they are prepotent in transmitting their valuable quality, should secure offspring of exceptional excellence.

In seeking to develop and improve a family possessing the excellence of the offspring, decided and rapid progress can be made if pairing is confined to members of this closely related group.

If, however, birds are bred together which have a like fault, defect or weakness, notwithstanding the fact that they possess other very valuable characters, the fault, defect or weakness is very sure to be transmitted in double degree to their chicks.

On the other hand, if the birds are sound of constitution and in perfect health, their blood-relationship need not prevent their being mated together for the

purpose of intensifying a valuable quality in the offspring.

Some breeders avoid pairing brothers and sisters. Others breed together the best birds for their purpose, regardless of relationship. The main thing is to know the birds and understand what one is doing.

A scheme of line breeding presented by the veteran poultry breeder, Mr. I. K. Felch, will best illustrate how the poultryman may proceed in safety and with surety of good results, if he will be careful rather than careless and act with intelligence rather than ignorance in making his selections.

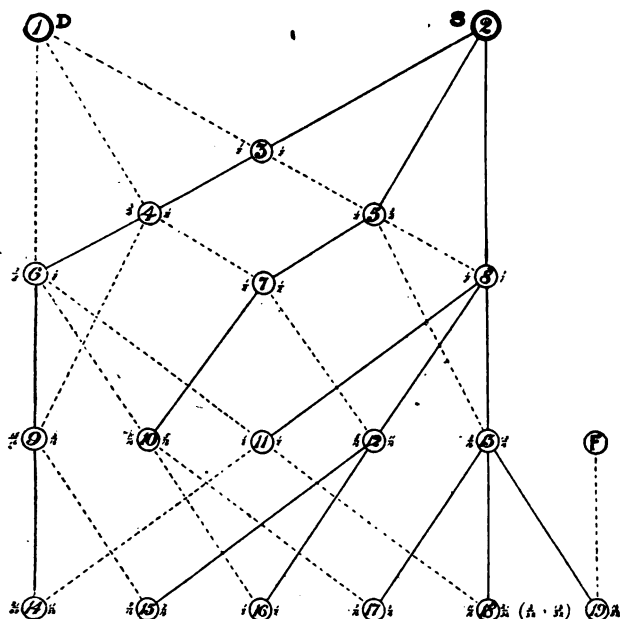
The poultry-breeder secures first a pair of birds which are the best obtainable for his purpose i. e. such as are possessed, at least in considerable degree, of the quality which he wishes to make a leading characteristic of his poultry family. This may be typical plumage, large egg-production, fine quality and large quantity of flesh or any other choice characteristic.

Beginning with the selected pair of pure-bred birds, the matings of successive seasons are so made that three decidedly distinct lines of breeding stock are developed. The second season the original sire is mated to one of his daughters, the choice of all the pullet chickens of the first year's hatching. The original dam is paired the second season, to one of her sons, the pick of the cockerel chickens. The third season the original sire, if still in good breeding condition, is mated to one of his daughters by the second season's mating to his own daughter. The original dam is mated in corresponding manner to one of her sons by her son, selected from the offspring of her second season's mating.

Two lines of breeding coming from the original pair, are thus established, one in which the blood of the original sire predominates and one in which the blood of the original dam is dominant. By breeding together two birds, each of the same generation, one from the sire line and the other from the opposite line, a third line is obtained having equal amounts of the blood of the original sire and dam, without pairing

brothers and sisters. The accompanying chart will make these and the succeeding steps very plain.

FELCH BREEDING CHART



Following is Mr. Felch's explanation of the chart and plan of line-breeding:

"Each dotted line represents the female as having been selected from the connected upper group, while the solid line shows the male as having been taken from the indicated upper group. Each circle represents the progeny. To-wit: female No. 1 mated with male No. 2 produces group No. 3, which is $\frac{1}{2}$ the blood of sire and dam.

"Females from group No. 3, mated back to their own sire No. 2, produce group No. 5, which is $\frac{3}{4}$ of the blood of the sire, No. 2, and $\frac{1}{4}$ the blood of the dam, No. 1.

"A male from group No. 3, mated back to his own dam, No. 1, produces group No. 4, which is $\frac{3}{4}$ of the blood of the dam, No. 1, and $\frac{1}{4}$ the blood of the sire, No. 2.

"We select a cockerel from group No. 5 and a pullet from group No. 4, or *vice versa*, which will produce group No. 7. This is mathematically half the blood of each of the original pair, No. 1 and No. 2. This is a second step towards producing a new line.

"Females from No. 5 mated back to the original male, No. 2, produce group No. 8, that are $\frac{7}{8}$ the blood of No. 2. A cockerel from No. 4, mated back to the original dam, No. 1, produces group No. 6 that is $\frac{7}{8}$ the blood of the original dam and only $\frac{1}{8}$ of the blood of the original sire.

"Again we select a male from No. 8 and females from No. 6 and for a third time produce chicks (in group No. 11) that are half the blood of each of the original pair. This is the third step and the seventh mating in securing complete breeding of our new strain. In all this we have not broken the line of sires, for every one has come from a group in which the preponderance of blood was that of the original sire. Nos. 2, 8, 13 and 18 are virtually the blood of No. 2.

"We have reached a point where we may wish to establish a male line whose blood is virtually that of our original dam, and we now select from No. 6 a male which we mate with a female from No. 4, and produce group No. 9, which is $\frac{13}{16}$ the blood of the original dam, No. 1, and $\frac{3}{16}$ the blood of the original sire.

"Again we select a male from No. 9 and a female of the new strain No. 11, and produce group No. 14 which becomes $\frac{21}{32}$ of the blood of the original dam, thus preserving her strain of blood.

"A male from No. 13, which is $\frac{13}{16}$ the blood of the original sire, No. 2, mated to females from No. 10, which are $\frac{5}{16}$ the blood of the original sire, No. 2, gives us group No. 17, which is $\frac{9}{16}$ the blood of said sire, while in No. 16 we have the new strain and in No. 18 the strain of our original sire, No. 2. Thus we have

three distinct strains, and by and with this systematic use we can go on breeding for all time to come."

If the breeder finds it desirable to introduce fresh blood, he may select a female fowl (F) as similar as possible to the strain already developed and breed her to a male bird of the sire line, e. g. from group No. 13. Her chicks by this mating possess 1-2 of her blood, 13-32 of the blood of the original sire, and 3-32 of the blood of the original dam. Her blood may then, through her progeny, be introduced wherever it seems to be necessary.

CROSS BREEDING. GRADING.

Cross breeding is the mating of birds of different breeds, varieties or families.

Progeny of the first crossing, if the mated birds are of congenial characteristics, usually possess the good qualities of the parents in satisfactory degree but prepotency is interrupted and further breeding between the crosses should be discouraged.

The cross-bred progeny may sometimes be bred back to one of the parent breeds with good effect. It is possible for the poultryman to introduce line breeding after the first cross breeding if the object in view and the accompanying conditions appear to warrant such a move. This has been done in cases where a dash of the blood of a certain breed was deemed desirable to improve another breed.

Violent crosses i. e. matings of birds of distinctly opposite or unlike characteristics, should be avoided. Such breeding usually brings Atavism into play and the results are often disappointing.

Improvement of common fowls is easily and economically accomplished by using pure-bred male birds. The progeny are termed grades. In breeding poultry the male bird is half the flock. His prepotency when mated with ordinary farm fowls, should give him hereditary influence exceeding that of his mates. Their robustness of constitution and excellent health make a good foundation on which to build a structure of beau-

tiful or profitable qualities through prepotency of the pure-bred male.

By continuing the use of superior male birds of an adapted breed for successive seasons the common fowls may be rapidly improved in such lines as the production of eggs and plump carcasses for market.

METHODS OF MATING.

Owing to the somewhat artificial standards of perfection adopted for several breeds and varieties of fowls, by the American Poultry Association, a new method of mating breeding stock has come into vogue among aspirants for exhibition honors. This method is very different from the natural way of mating with the idea of selecting exhibition birds of both sexes from the progeny of the same parentage. The old way has seemed slow and unsatisfactory to some fanciers although others pronounce it suitable for their purpose.

Double mating, so-called, provides separate pairing for breeding exhibition male and female birds.

To produce standard or exhibition cockerels of some breeds, a mating (termed a cockerel mating) is made which is intended to yield among the cockerel chickens, a large proportion which will develop characteristics closely approaching the type fixed by the Standard of Perfection for cockerels of the breed or variety in question. The female chickens hatched and raised from this cockerel mating are not expected to meet standard requirements.

A so-called pullet mating, on the other hand, seeks to secure pullets of standard quality with the expectation of sacrificing the cockerel chicks.

A simple illustrative case will show how the method is applied. The standard for Single Comb White Leghorns requires the male bird to have an erect comb while the female should carry a comb folded over the head.

To promptly get cockerels having upright standard combs, a male bird having as nearly a typical comb as possible, is mated to a female having an erect comb.

According to the laws of Heredity, these two birds, having each an erect comb should certainly convey this character to their offspring. Both the cockerel and pullet chicks will develop a preponderance of erect combs. The exhibition cockerels are selected from the flock and the pullets are passed by unless one or two are selected for future cockerel matings.

For the pullet mating, a female having a typical folded comb is mated with a male bird which has a lopped comb. From the resulting offspring the exhibition pullets are chosen and the cockerels are used for the table or marketed.

Double mating is extensively applied in breeding exhibition birds of parti-colored varieties such as the Barred Plymouth Rocks, Dark Brahmas, Partridge Cochins and Silver Pencilled Wyandots.

By continuing the process through successive seasons, some very fine specimens, according to the Standard of Perfection, may be obtained, but the breeder has in reality split the breed into two branches sufficiently different to be considered separate varieties.

Whatever the method followed, the results in poultry breeding depend mainly upon the understanding, study, experience and skill of the breeder. It is he who marshals the forces of Inheritance, Environment and Exercise in combinations to conquer obstacles and win success.

CHAPTER III

Incubation

The successful hatching of hens' eggs into strong, sturdy chicks depends partly on correct conditions of incubation and partly on the combination of influences affecting the breeding stock which produces the eggs.

The development of a perfect hatching egg is not the work of a few hours or a few days. Every egg has a pedigree extending back through many generations of breeding birds. Previous to the actual making of the egg in the body of the mother bird, influences have been in operation determining, in large degree, the qualities of the germ-cell and the characteristics which it will transmit to the chick which comes from it.

The factors of breeding have had a very important influence through the successive generations of the ancestry of the egg. These factors should have been wisely directed to insure results in the egg favorable to the production of a chick answering the purpose of the poultryman.

The food and feeding of the parent birds and of the generations preceding them, must have been conducive to healthy, natural, satisfactory reproduction.

Certainly no sickness or tendency to disease, no organic or constitutional weakness, no degeneration of any organ or body-part should have occurred in any of the breeding stock involved in the production of eggs that are expected to develop into valuable chicks under the influences of incubation.

FOUR PRACTICAL POINTS.

Four important conditions relative to the actual parent birds which produce the eggs. are these:

1. The birds should be well matured. The results of special experiments show conclusively that, other

things being equal, the eggs of adult hens hatch better and produce better chicks than the eggs of immature pullets. The practical experience of many poultrymen confirms this conclusion. It is an excellent plan, therefore, to test the laying quality of the birds during their first laying season, not attempting to use any of these pullets' eggs for hatching, and reserve the best of these birds for breeding the next season.

2. The parent birds should not have been forced to excessive breeding. Avoid mating a male bird with too many females, and do not push the egg-production of the hens to extremes, especially during cold weather. It is not reasonable to expect a fowl to begin laying in the early fall, continue laying through the winter months and then furnish numerous eggs for successful hatching in the spring.

3. The breeding stock should take physical exercise at least sufficient to keep all the organs of the body in good healthy condition. The blood must be kept in active circulation. Running on ample range or scratching in litter for a portion of their living is advantageous.

4. The fowls should lay the eggs during the natural breeding season of birds, the springtime of the temperate zone, the usual "nesting time" of wild birds.

THE FORMATION OF THE EGG.

Numerous minute female eggs are clustered closely in the hen's ovary, which is attached to the rear of the diaphragm, slightly to the left of and below the spinal column. Each little globule, which is the beginning of an egg, is enclosed within a thin transparent membrane termed an ovisac. The yolk of the egg develops and enlarges until it bursts from the ovisac and drops into the mouth of the oviduct. The yolk carrying the female germ is surrounded by a very thin membrane which is called the yolk-sac. The oviduct, or egg-tube, during breeding time, is about one-half inch in diameter and folds upon itself within the abdominal cavity, so that its actual length is from twenty to thirty inches in adult fowls. It conveys the eggs from the region of

the ovary to the *cloaca* connecting with the vent. During this journey each egg is completed and prepared for laying. The mucous inner linings of the oviduct secrete and supply the albumen, which, placed around the yolk, forms the "white" of the egg. The layer immediately surrounding the yolk-sac is rather thin albumen and this is enveloped by a layer of thicker albumen. Then comes another layer of thin albumen. Two curious whitish cords of thick, twisted albumen extend from opposite sides of the yolk through the layers of albumen to opposite ends of the egg. By their weight and tension these cords help to hold the yolk in position, floating midway of the egg with the germ-cell on top, keeping the latter immersed in the white of the egg and preventing it from coming in contact with the shell. In the course of its passage along inside the oviduct, the egg receives its "soft shell," an envelope composed of two thin whitish membranes, which separate at the large end of the egg to form the "air-cell." Next surrounding and protecting all the parts described, comes the outer shell, which is formed mainly of calcium carbonate supplied in soluble form. The shell may receive a finishing coat of pigment to give the outside a distinguishing tint. After the shell has hardened, its particles form little prisms, which, standing side by side and extending from the inner to the outer parts of the shell, form the sides of little pores allowing the slow passage of air and gaseous compounds through the shell. The egg being fully formed and finished, passes from the oviduct into the *cloaca* and soon after is "laid."

FRESHNESS AND FERTILITY OF EGGS.

Eggs selected for hatching should certainly be fresh and fertile to secure desirable results. Experience has proved that every day after the fertile egg is a week old it loses somewhat in hatching power. To set eggs that are more than two weeks old is to decidedly increase the chances of "death in the shell" or weakness of the chicks if the eggs hatch.

The poultry breeder seeks to secure the sure fer-

tilization of the eggs by careful mating of his vigorous, healthy breeding stock according to the facts and factors already considered and by their proper feeding and management during the breeding season. To insure the highest percentage of fertility in the eggs, two male birds are sometimes used with one flock of hens, alternating their services day by day. Abundant range or exercise and fresh green food are favorable to fertility and good hatching quality.

The fertility of the egg can not be certainly determined before incubation begins without breaking the shell, which would destroy its power of hatching.

The interested poultryman who is willing to study a few eggs may find it instructive to examine and compare several germ-cells. A person who has keen eyesight or who will use a lens of moderate magnifying power, can readily detect a difference in the appearance of infertile and fertile germ-cells. Open a space of the size of a silver quarter of a dollar in the shell of an egg, midway between the ends or carefully break the shell and gently empty its contents into a saucer. The yolk, floating towards the top in the white of the egg, carries, imbedded in its upper surface, the germ-cell—a circular spot about one-eighth of an inch in diameter. The female egg-cell which has failed to be fertilized or fecundated by the male germ, has a whitish appearance except that little clear spots are distributed here and there over its surface. The fertilized germ-cell has an outer margin which is whitish and within this a small clear circle containing little whitish dots. This clear, central portion of the fecundated cell is the germ which develops by incubation into the embryo chick.

There is some variation in the appearance of fertile germ-cells because fecundation of the female cell takes place before the yolk has proceeded far in the oviduct and development of the embryo often begins while the egg is within the body of the fowl.

The perfect fertilized germ-cell, in the first place, is a single cell. Under the influence of the body heat surrounding it in the oviduct, and because of the life

and reproductive power within itself, this cell divides, each half then enlarging until it has increased to the size of the mother-cell. Next each of the two new cells divides and forms another pair of cells and they grow to the size of their parent cells. If this process continues to a considerable extent, the multiplication and crowding together of cells causes the beginning embryo to present a surface appearance, which is termed the "mulberry" stage of development. If the germ-cell thus develops to a considerable degree within the oviduct and the egg is then laid and kept warm by successive hens laying in the same nest or by a broody hen sitting in the nest, cell division may continue and embryonic development be carried too far to allow of a halt in the process, such as naturally and safely occurs when the egg is cooled soon after it is laid.

TREATMENT AND CARE OF EGGS BEFORE INCUBATING.

After seriously studying the structure and formation of an egg, the poultryman comes to realize that it is a delicate living organism requiring careful treatment, especially if it is to be used for hatching into a live, lusty chick.

The eggs should be collected, by clean hands, from the laying nests frequently enough to avoid any danger of premature incubation or of subjection to freezing temperature. Cleanliness of the eggs is insured if the nesting material is renewed before it becomes dirty and the fowls have dry or well littered quarters, consequently clean feet, and are kept from roosting on or in the nests.

Keep the eggs in a cool place but safe from freezing. The air of the place should be pure but not dry enough or in motion sufficiently to cause evaporation of any of the liquid contents of the eggs. The air-cell is an index of the last mentioned condition. If the air-cell enlarges there has been loss of the liquid portion of the egg to some extent by evaporation through the pores of the shell.

It is natural for an egg to rest upon its side and it

is well to keep the eggs from contact with each other. Turning of the eggs, if gently done, every second or third day will do no harm. Allow no grease or foulness to come in contact with the eggs. Begin incubating as soon as possible and practicable after the eggs are laid.

Examine the eggs and cull out every one that by sight, touch, sound or any other means appears likely to fail in hatching or liable to produce an undesirable chick. Reject such as are extra large or very small for the breed, also those of unusual shape, or having mottled, coarse or porous shells, and such as have thin, papery or very thick, hard, metallic-like shells. Some eggs if tapped with the metallic end of a pen-holder give out a sharp metallic sound and such are usually rejected by the experienced hatcher.

It is well to make a critical examination of the eggs before beginning incubation by means of an egg-tester such as is used in testing eggs during the process of incubation. All of the imperfections of shell show up vividly before the strong light of the tester. Imperfect conditions inside the egg also become visible by this means in some cases. Discard any eggs that are old as indicated by large air-cell, also any that have the inner membrane of the air-cell ruptured, indicating rough handling or shaking of the eggs, likewise any that show a veinwork of blood vessels or a circle of red color indicating that the egg has been partially incubated or that the embryo is dead.

If the observer is doubtful as to some of the eggs these may be marked with a pencil, their peculiarities noted and then incubated with the other eggs that appear to be all right. During incubation the eggs that were considered doubtful may be frequently examined and in this way the hatcher will learn at first hand many important points in regard to the incubating quality of eggs. Each successive hatching which he faithfully studies will add to his knowledge in a very practical way.

A SPECIAL STUDY OF INCUBATING EGGS.

The poultryman who is sufficiently progressive to take a three weeks' course of home study in embryology, will thereby lay the foundation for intelligent hatching of chickens. Such a course will prove interesting as well as instructive and need not be expensive. The sacrifice of a number of eggs and the spending of some time and thought will enable the student thus to learn some very valuable lessons.

A good egg-tester is a necessary aid in his investigations. If electric light is at hand the poultryman is fortunate. Such light is very penetrating. Acetylene gas yields a brilliant, white flame and may be readily obtained by purchasing a bicycle lamp. The calcium carbide used to produce the gas is not expensive. If neither of these forms of light is available, a good kitchen lamp, burning kerosene oil, will answer fairly well. The common form of egg-tester usually furnished with an incubator is simply a tin chimney made to fit on the burner of a hand lamp. It has an egg-hole at one side on the level of the lamp flame. This metallic chimney is liable to become very much heated when in use.

A better arrangement, especially if an electric bulb or a bicycle lamp is available, is made of galvanized iron in the form of a cylinder, about six inches in diameter and ten inches high, provided at one side with a branch tube two and one-half inches in diameter and two and one-half inches long, the latter being placed so that it will be on a level with the light. The outer end of the branch tube is covered with a piece of black felt cloth or dark flannel, in which is cut a circular or oval hole about one and one-half inches wide, or just a little less than the width of the eggs to be tested. This piece of cloth is held fast against the end of the tube by a ring of galvanized iron or tin one-half inch wide, which fits closely over the cloth and the end of the tube. Six or eight half-inch holes are cut in the large cylinder an

inch from its lower edge and on the side opposite the branch tube, to supply air from below.

In ordinary testing, which is done in a dark room during incubation, each egg is held successively against the hole in the cloth, at the end of the branch tube, the strong light of the tester penetrating the egg and making its contents more or less visible to the operator. The latter may observe the egg from one side if he prefers and thus relieve the eyes from looking directly towards the light of the tester.

In studying the development of the embryo and the appearance of the various parts of the egg, the latter may be held against the egg-hole of the tester in different positions to facilitate observation.

THE SUCCESSIVE STAGES OF INCUBATION.

Selected white-shelled eggs are placed, some under broody hens and some in an incubator if one is available, so as to compare eggs naturally and artificially incubated, while studying the successive stages of the development of the embryo chicks in the egg.

At the end of twenty-four hours of incubation a change can be detected in the fertile egg held before the egg-tester, if its search-light is very strong and the shell of the egg thin and white or nearly transparent. By cell division and multiplication the germ's surface or skin (*blastoderm*) has increased in size and shows against the faint yolk-shadow as a small shadow-circle (about one-half inch in diameter), having a slightly reddish or rosy tint.

At the end of another day the circle has increased in size to three-fourths of an inch or perhaps an inch in diameter and the tint is of slightly deeper tinge.

After seventy-two hours of incubating the *blastoderm* shows a decidedly bright reddish color especially if the shell of the egg is nearly transparent. Its size has increased to about one and one-quarter inches. The central portion appears slightly lighter than the parts at and near the circumference.

By holding an egg, during the early stages of in-

cubation, in a horizontal position against the egg-hole of the tester and looking down upon it as it is gently revolved in the hand, the yolk is seen to float with the *blastoderm* always on its uppermost side.

By placing two or three fresh eggs under the sitting hen or in the incubator on the second day and several more on the third day after beginning the experiment, the student may have at one time, eggs of one, two and three days incubating, to examine. After comparing these before the search-light of the egg-tester he may open their shells and carefully deposit their contents in separate saucers or in glass bowls half filled with water. The beginnings of embryonic development are plainly visible. The *blastoderm* of the germ appears on the upper side of the floating yolk and its color is seen to be due to the blood which fills the fine net-work of veins spreading out from the center of the embryo, over the surface of the yolk. The circumference of the collection of ramifying blood-vessels is bordered by a vein which is named the *sinus terminalis*. As the net-work of capillary veins enlarges from day to day this terminating or bordering vein extends in a wider circumference, more and more distant from the embryo-center.

At the end of the fourth day the outer bordering portion of the net-work having followed further around the yolk shows decidedly darker than the central portion, except for the dark spot which is the shadow of the embryo itself.

After five days of incubation are completed the embryonic development has become very distinct and decided. The blood-vessels have extended their meshes fully half way around the yolk and their shadow gives a dark appearance to the part of the egg that they occupy. The border of the shadow along the middle axis of the egg shows darkest as the egg is held vertically before the tester.

The body of the embryo shows in the midst of the shadow as a blurred image with a dark spot near one end which is an eye.

The embryo, at this stage, shows some independent movement when the egg is held still before the tester. It appears to swim in a clear space. It is, in fact, surrounded by a sac filled with thin, transparent fluid (the *amnion*) which is imbedded in the yolk and helps to prevent the embryo's too near approach to the shell, during the first half of the period of incubation.

At this time eggs from under the sitting hens should be carefully compared with some from the incubator. If the eggs from both machine and hens appear alike in their development, it is safe to conclude that the machine is providing conditions of incubation that are satisfactory. If decided differences in appearance are noticed the same should be carefully studied. The eggs under the influences of natural incubation may show, before the tester, only slight increase in the size of the air-cell, somewhat dull and indistinct outline of the blood-vessels and slightly blurred appearance of the embryo while the eggs from the incubator may show bright scarlet veins having their edges sharply defined and an embryo distinctly outlined, dark in color and with an eye-spot decidedly black. Possibly the air-cell has increased considerably in size.

If any of these differences in appearance are observed by the experimenter he may conclude that the hens are doing better incubating than the machine. Appearances as noted indicate that the fertile eggs under the hens should successfully hatch into strong chicks.

The artificial method, however, according to the indications mentioned, has provided too high a temperature at some time or times, too much air (excessive ventilation) or too little moisture in the atmosphere of the egg-chamber during the early days of incubation. The heart action and blood circulation are too emphatic and there may come reaction.

If, furthermore, the bordering vein of the blastoderm shows through the shell of the egg, it is additional and emphatic testimony to the injurious effects of one or more of the unfavorable conditions just mentioned. If the bordering vein appears as a bright red circle

(blood-ring) there has been a hemorrhage and death in the shell. The expired embryo may then appear as a dark spot close against the inner shell or floating in the white of the egg. If the contents of the egg have a cloudy appearance and no life movement the germ has started and died. Any eggs that fail to show motion or life within should be opened and examined to determine what has taken place.

If the air-cell is much enlarged there has been too great evaporation of the liquid contents of the egg and the *amnion* probably lacks somewhat of the limpid albumen which should surround and protect the embryo.

Eggs which appear clear, like fresh eggs, before the tester are infertile and will not develop embryos.

At the close of the sixth day of incubating, the large ends of the eggs are carefully looked at before the tester to see if the blood-vessels of the *blastoderm* have succeeded in passing across under the air-cell. If the air-cell has increased much in size, this passage may be hindered. The distance across is increased and the direct evaporation tends to leave the albumen between the yolk and the air-cell thicker than it should be. Further the net-work of veins is liable to halt in its advance under the air-cell, turn at its edge and fold back upon itself instead of continuing to surround the yolk as it should.

After seven full days have elapsed the veins should show beyond the air-cell and correspondingly on the opposite side of the yolk at the small end of the egg. The embryo, at this stage, should appear very active in its movements, diving about within its watery sac, now disappearing from sight for a moment, deep down in the *amnion*, then reappearing, plunging this way and that and seemingly well satisfied with the conditions of life within an egg-shell.

At this stage of incubation, even dark shelled eggs may be satisfactorily examined before a good egg-tester.

If the eggs from the incubator appear to be less forward in development than those from under the sitting hens, it will be well to open several of each lot and ex-

amine closely. The fine net-work of veins should have nearly enclosed the yolk. If there has been a halting and folding at the edges, part of the yolk's surface will be left uncovered by blood-vessels with a consequent failure to utilize some of the sources of nourishment for the growth of the embryo.

Eight days should have given ample time for the complete surrounding of the yolk by the net-work of veins. An egg should be opened to see how this enclosing of the yolk appears at close range.

Another series of blood-vessels appears—the veins of the *allantois* which starts out at the abdomen of the embryo about the third day of incubation and gradually spreads, with its net-work of large and small veins, until it encloses the white and the yolk together and ramifies over the inner membrane of the soft shell of the egg.

By the end of the ninth day the large blood-vessels of the *allantois* show conspicuously, floating in the albumen, near the inner shell, in the area just below the air-cell, where also the movements of the embryo are also evident.

After ten days the *allantois* veining has become very apparent in the somewhat clear region next to the air-cell. The *allantois* system of veins helps to darken the shadow before the egg-tester, contrasting strongly with the very clear space shown by the somewhat enlarged air-cell.

Eleven days of development having taken place, several eggs should be opened in order to observe the embryo, now completely formed as to its body-parts and organs. The little organism will live for some minutes after the egg is opened and the throbbing heart is conspicuous because of its pulsing as it pumps the blood through the veins that fill the flattened mass of albumen and redden it with their ramifications.

The next nine or ten days constitute the period of growth of the successfully shaped embryo chick. The rapid increase in size of the body-parts from day to day causes the gradual decided darkening of the contents of the egg. The numerous blood-vessels help to shade

the picture so that soon only an opaque oval form shows before the tester, except for the clear area of the air-cell and narrow space below it, which still allows some light to percolate through and permits the movements of the embryo to be detected. The air-cell enlarges rapidly during the last week of incubation because of the escape of the waste products of growth through the shell.

At the close of the fourteenth day, if any of the eggs show, before the tester, areas on one side or at the small end that are clear or yellowish instead of dark opaque, these eggs should be marked and especial care taken to note whether they hatch or not and if they do hatch what sort of chicks come from them. This appearance is usually due to the folding back of the veins or their failure to occupy the areas which lack opaqueness.

By the end of the nineteenth day some of the eggs placed before the tester, may show a perfectly opaque oval, due to the chick having burst through the inner membrane and occupied the space of the air-cell. In this case he has begun to breathe with his lungs and may very likely be heard to peep in the shell occasionally.

On the twentieth day most of the chicks in the shells should burst their barriers and begin life outside the shells. All the live chicks should certainly be hatched by the end of the twenty-first day.

Any eggs that fail to hatch should be looked at before the tester and then be broken open and examined critically, to learn, if possible, the reason of their dying in the shell.

In eggs showing areas of albumen not covered with veins, the chicks may have failed to complete their growth or possess too little strength to hatch because of lack of sufficient nourishment. Possibly this condition may trace back to lack of vigor in the parent breeding stock or to their improper feeding. If this is not the case there may have been too high a temperature maintained in the first days of incubation or too low a temperature in the under parts of the eggs.

Sometimes the chick succeeds in breaking through

the shell but becomes choked with unused albumen and dies by strangulation.

Death in the shell is sometimes associated with untimely changes of the *allantois*. This temporary organ by its net-work of blood-vessels gathers nutriment from the albumen and partly takes the place of lungs, by gathering oxygen from the air through the pores of the shell. The blood of the *allantois* veins should be withdrawn into the body of the chick at about the time the lungs come into use. If the *allantois* blood circulation ceases too soon, before the chick breaks the shell, the lungs may not get a sufficient supply of air and suffocation results. This condition may be due to lack of adequate ventilation of the eggs during the third week of incubation.

On the other hand the *allantois* may continue active operations too long, after the lungs are in use for breathing. Carbonic dioxid gas is inhaled with the little air obtainable and if the chick's bill does not quickly break through the shell, death by asphyxiation or exhaustion occurs. Excessive ventilation of the eggs during the latter half of the period of incubation aggravates this condition. Thick, tough shells increase the danger from this disorder.

If the shells of the eggs have not become sufficiently weakened to permit of being easily pipped, and hatching is prolonged beyond the twenty-first day, some chicks may fail to emerge but if they did hatch would very likely come out cripples.

Before hatching the chick should enclose the remaining yolk within its abdomen. If there is a failure to do this and to completely close the navel, it is better that the chick should die in the shell rather than to come forth to be disembowelled and suffer a lingering death.

THE NATURAL METHOD OF HATCHING.

The majority of chickens are hatched by means of sitting hens. Where only a few broods or even several

hundred chickens are to be hatched yearly, this plan is usually satisfactory.

As a rule mature fowls are better than pullets at incubating eggs.

Successful hatching depends largely upon the selection of good sitting hens. Birds of the American class of breeds, such as the Plymouth Rocks, Wyandottes and Rhode Island Reds, usually make excellent hatchers and brooders.

Asiatic breeds, like Brahmas and Cochins are persistent sitters but sometimes are too heavy or clumsy for the safety of the eggs.

Fowls of the Mediterranean class, such as the Leghorns and Minorcas rarely become broody until they are several years old. Though small in size they then make good sitters in the majority of cases.

Hens that are very nervous, pugnacious or cold blooded should not be chosen for the hatching of chickens.

SELECTING AND FURNISHING THE SITTING PLACE.

It is well to set apart a room or hen-house for the exclusive use of the sitting hens during the hatching season. If this place has been used for poultry or is likely to have harbored vermin, it should be thoroughly cleaned out, sprayed with two per cent. solution of carbolic acid and fumigated with burning brimstone before using as a hatching place.

Ventilation should be provided for, so that fresh, pure air will fill the room continually. If the room has a window of two sashes, the lower one may be raised several inches and a board inserted to fill the space below it. Fresh air can then come in between the two sashes, at the middle of the window, without danger of the wind ever blowing directly upon the sitting hens or upon the eggs in the nests when the birds are off feeding. In mild weather a better plan is to remove the sashes and cover the window frame with burlap or cotton cloth. The window space may be protected by wire netting if necessary.

The door should have a lock and be kept fastened unless the place is absolutely safe from intrusion.

The floor may well be of sandy loam. A dusting place should be provided in the lightest part of the room.

Adjoining the room on the sunny side make a small run, surrounded and covered with wire netting. The ground within the enclosure should be in turf except a portion near the building, which should be spaded up to provide a scratching and dusting place on pleasant days.

NEAT AND NATURAL NESTS.

When a fowl makes her nest upon the ground she usually selects a hollow spot in some secluded place, collects a few dry leaves or bits of straw to line the nest, lays her clutch of eggs, sits upon them comfortably and contentedly the allotted time and hatches all the eggs into healthy, hardy chicks. We may well imitate her method in order to secure like excellent results.

Take empty boxes, obtainable at the grocery stores, and place them in rows on the floor along the sides of the sitting place, as many as may be needed for the sitting hens. An egg-case or an orange box will make two nests for medium sized sitting hens or a soap box will make an ample sized single nest.

Each empty box is turned upon its side, the open top thus becoming the front of the nest. A strip of board is nailed along the front, with the upper edge three or four inches above the bottom of the nest, to keep the nesting material in place and prevent the eggs from rolling out.

If the floor is of boards or concrete, mellow, moist loam or an inverted piece of grass turf may be placed in the bottom of each nest-box. The loam is hollowed out and shaped to nicely hold the eggs and have their upper surface conform to the contour of the under part of the hen's body.

If the house has a dirt floor, hollows for the nests may be made in the soil and the bottom boards of the nest boxes removed. The bottomless boxes are placed

over the nest hollows, in which soft, short straw or hay is laid for the eggs to rest upon.

The front of each nest should have a little door of slats or wire netting to keep the hens shut in when this is necessary. A piece of coarse burlap sacking is provided for each nest to be hung over the front of the box whenever it is desired to make it darker inside without shutting out the fresh air.

FURTHER FURNISHINGS.

A galvanized or heavy tin pail, large enough to hold a sufficient supply of drinking water, is placed on a block or shelf raised several inches above the floor, so that the hens, when off the nests, will not be able to scratch anything into the water.

A clean, shallow box or trough is placed in a convenient position near the window for holding the daily ration of whole grain.

Everything in the room should be easily removable so that it may be taken out and sprayed or washed with two per cent. solution of carbolic acid.

SETTING THE SITTERS.

When a trusty hen becomes broody and is to be used for incubating, first dust her thoroughly with lice-powder, working the fine dry dust among the fluffy feathers clear to the skin.

After dark is the safest time for removing the hen from her laying nest to the sitting place. Two or three china eggs placed in the nest will make it more attractive to the broody hen. After settling her gently in the nest the little door in front is closed and the burlap cloth hung over it.

Fresh water and whole corn (maize) are placed in the room ready for the morrow.

The following day, towards evening, the burlap cloth and the slatted door are removed from the front of the nest to permit the hen to come off and feed. If she stays upon the nest leave her until morning and then try her again. If she does not then come off of her own accord,

remove her quietly from the nest by sliding the hands under her body, gently lifting and depositing her on the ground. If, after feeding, drinking and dusting, she returns to her nest, it is time to place under her a sitting of eggs, usually not more than thirteen and never a larger number than she can cover completely and comfortably.

It is advantageous to set several hens at one time because on testing the eggs about the fifth or sixth day of incubation, if a number of the eggs prove to be infertile or have stopped development these may be discarded and perhaps leave one hen free to be set again on fresh eggs or to be broken of her broodiness and returned to the laying house. Further if several hens hatch their broods at the same time, the chickens may be given to the care of as many hens as need be and the other sitters given fresh eggs to incubate or turned free to prepare for further egg-production.

When setting the hens in the hatching house, place a card above each nest and upon it record the time of setting, number and breed or pen that produced the eggs, and any special items for future reference. Later note on the card the results of the testing of the eggs and of any transfers of eggs. Finally write down the results of the hatch. Preserve the card for future use in studying the results, for guidance in mating the breeding stock, choosing sitting hens and working out further progressive steps in poultry practice.

Dust the sitting hens again at the end of the first and second weeks of incubation.

Test the eggs before an egg-tester on the fifth day if the eggs are white shelled or a day or two later if the eggs have tinted shells. Infertile eggs may be used for cooking in the household but any eggs that have dead embryos should be saved to feed to the chicks that hatch later.

If the air-cells show much enlargement by the fifth day it will be well to pour several quarts of tepid water into the loam at the bottom of the nest. This will tend

to increase the humidity of the air surrounding the eggs.

Allow the hens to come off of the nests dally. If there are many hens sitting in the room it may be necessary to keep the fronts of the nests closed and regularly every morning open the slatted doors for half an hour. If any hens fail to come off for their daily feed they may be gently removed from the nests by hand. If there are too many hens to be all let out together, they may be set free by squads. A half hour is long enough to allow the hens to be off the nests at one time. At the end of that time look to the nests and see that every one has a hen sitting upon the eggs.

Eggs under hens usually hatch out on the twentieth day. The hens should be left in peace while the chicks are coming out of the shells and for twenty-four hours thereafter.

ARTIFICIAL HATCHING.

If the poultryman desires to keep his hens laying eggs or wishes to do hatching out of season or aims to produce chickens in great numbers he usually resorts to hatching by machines.

Artificial incubation has been practiced for thousands of years as is evidenced by the ancient hatching ovens of Egypt and China. Mammoth central incubating plants, constructed and managed as of old, are still to be found in these countries. Eggs for hatching are brought in from all the country around, are carefully incubated in charge of expert and experienced operators, and the chicks are distributed over the district to be brooded and reared.

The plan of establishing large central hatcheries and distributing newly hatched chicks about the country is already in operation in America but modern incubators, with the exception of a few mammoth machines, are limited in capacity to a few hundred eggs. These incubators are owned and operated by poultrymen of more or less experience, and the results show extreme variation.

SELECTING THE INCUBATOR.

The modern hatching machines are of numerous patterns but may be grouped in two classes, those heated by hot water and those heated by hot air. The source of heat in both classes is usually a lamp burning petroleum oil.

In selecting an incubator for his use the poultryman may well consider carefully the following points:

1. The heating system should be safe, of ample power and under perfect automatic regulation, within reasonable limits.

2. The ventilating system should be capable of easy adjustment so that the amount of pure air positively supplied to the eggs may be under complete control.

3. It should be possible to ascertain and regulate easily the amount of moisture in the atmosphere of the egg-chamber.

4. The walls of the incubator should be sufficiently insulated to prevent the influence of outside temperature causing uneven temperatures on the level of the egg-trays.

5. The machine should be made of first-class materials and carefully constructed.

6. The poultryman should have the privilege of personally testing the machine in operation, under the conditions of his local surroundings, before the purchase is finally concluded.

THE INCUBATOR ROOM.

The room in which the incubator is operated should hold an even temperature and not be liable to sudden fluctuations because of outside changes in the weather.

Ventilation should be ample and under control so that there will be no liability of strong drafts of air striking directly against the lamps or the incubators.

The room should be well lighted so that all of the operations, including the reading of the thermometers in the egg-chambers, can be conducted without difficulty or discomfort so far as the eye-sight is concerned. The

windows should be provided with shades if the sun is liable to shine directly upon an incubator while in operation.

SETTING UP AND OPERATING THE MACHINES.

If it is desired to hold the manufacturer of the incubator responsible for the results in hatchings, his directions should be followed in setting up and running the machine.

See that the incubator stands firm and level in its place. The lamp should be clean, full of good oil and have a new, nicely fitting wick. In starting up use a small flame and heat the egg-chamber gradually. Adjust the regulator in time to prevent the temperature rising so high as to crack the bulb of the thermometer in the egg-chamber. Fill the lamp with oil daily and use a knife-blade to remove the crust at the top of the wick.

It is well to run the machine without eggs for several days, especially if it is a new one, so that it will become nicely warmed through, well regulated and under complete control of the operator, who by this means also becomes familiar with the peculiar characteristics of the hatcher.

Incubator thermometers are liable to be inaccurate and to change in the course of months. They should be tested and corrected once a year. This is readily done by obtaining a physician's tested, guaranteed thermometer and comparing it with the incubator thermometers. Place the bulbs of all of the thermometers in water of about one hundred degrees warmth on the same level and note any variation of an incubator thermometer as compared with the clinical thermometer (Fahrenheit).

If convenient test the temperature of the egg-chamber of the machine on the level of the tray by placing several thermometers in different positions all on this level. If the temperature at one side of the chamber is shown to be lower than elsewhere, raise that part of the tray until its temperature is regulated as near as may be to correspond with the readings of the other thermometers.

Extinguish the flame of the incubator lamp an hour or more before the eggs are to be placed in the machine. Arrange the selected eggs on the trays and let them stand in the incubator room long enough to gain its temperature. Then slide the trays into place in the incubator and light the lamp. It is well to begin incubating in the morning so that the eggs and egg-chamber will have time to warm up during the day and allow of regulation before the operator retires for the night.

Do not let the temperature on the level of the tops of the eggs rise above 101° for several days and certainly not above 102° during the first week. The living tissues of the embryo are delicate and the danger from excessive heat in artificial incubating is very great.

Ventilation of the egg-chamber may be restricted the first few days, because only a slight amount of air is required to supply oxygen for the small net-work of blood-vessels within each live-egg.

Now is the time to supply extra moisture by means of water trays or wet sponges placed within the egg-chamber if the air surrounding the eggs is at all dry. If the machine is warmed by means of hot air moving in a current through the egg-chamber it is possible to increase its humidity by sprinkling the floor of the room plentifully or frequently with water. The moisture evaporates and is taken up by the air of the room and some of this air after being heated by the incubator lamp, passes into the egg-chamber. The moisture in the air tends by its action on the shells of the eggs, to decrease the size of the pores of the shells and thus diminish the supply of air and therefore of oxygen passing into the eggs. It is thus seen that the supply of air may be reduced by restricting ventilation or by increasing the humidity of the air in the chamber of the incubator.

Let the eggs remain on the trays without moving for three full days. On the fourth day gently turn the eggs by hand a little and reverse the trays. On the fifth day the eggs may be rolled over and moved about to change their positions on the trays besides reversing the trays

end for end and right for left. If the eggs are tested on this day the regular turning may be omitted. Infertile eggs and any eggs that, before the tester, show defective development or weakness, should be removed from the trays.

For the second week the conditions of management are but little changed. The increasing systems of blood-vessels call for some increase in ventilation but the supply of air need not be excessive. Keep the temperature on the level of the tops of the eggs at about 102° and certainly below 103°. If the air is dry keep the water pans filled up to the twelfth day.

On the fourteenth day examine the eggs before the tester and throw out any that fail to show life or liveliness of the embryo. Omit the supplying of extra moisture during the last week of incubation. Keep the temperature at 103° on the level of the tops of the eggs until the eggs begin to be pipped, when it may rise to 104° or 105° with good effect. If the air is dry, extra moisture may be placed in the water pans or wet sponges may be placed in the hatching chamber on the twentieth day.

Give full ventilation to provide abundant pure air to the eggs during the last seven days of the period of incubation. The egg is now full of blood-vessels and much oxygen is required in the rapid processes of growth of the embryo. If the weather is warm or sultry it will be advisable to turn the eggs twice daily during the last week of incubation. The airing they thus receive helps supply the much needed oxygen for the multitudinous blood-vesels in the eggs.

On the twentieth day, if the temperature has averaged about right and other conditions have been kept favorable, the eggs will yield to the peckings of their inmates and allow the chicks to dry their downy coverings and exercise their lungs in the free air. The chicks drop from the trays into the nursery and may remain there for one or two days before being removed to the brooders.

CHAPTER IV

Brooding

The successful brooding of chickens depends upon conditions which may be divided into two groups.

One group is the combination of influences which decide whether the chicks shall be well hatched or not.

The other group includes the influences acting upon the chicks during the actual brooding period of their lives.

It is not true that the influences of the first group affect only the embryo chick and cease to have effect after hatching. On the contrary, chicks well hatched are half brooded.

LIVELY AND LISTLESS CHICKS.

The chicks themselves are the best indicators of their condition and of their chances of future growth to profitable age.

Healthy, hungry, vigorous chicks that have come out of the shells on time and are decidedly lively, will grow thriftily throughout the brooding period under reasonably favorable conditions of management.

Weak, inactive chicks that appear sleepy or stupid, are thirsty but not hungry, hug the heat and walk with tottering gait, not having been properly started in life, will dwindle, diminish and die in spite of perfect conditions of brooding. Even the best of care and faultless surrounding conditions can not save them, and if they could be saved and grown they would probably prove to be profitless poultry.

Mistakes before Incubation:—Some of the conditions which injuriously affect the chicks during the incubating period of the eggs and reduce the chances of successful growth during the brooding stage, are the following: Using weak or immature parent stock,

neglect of constitution, health and vigor of body-parts in breeding for fancy points, abuse of the reproductive organs as in excessive egg-laying, neglect of the facts of breeding, improper feeding, including rations that are over-fattening or contain insufficient nourishment, the use of condiments or condimental mixtures, lack of mineral constituents in the feeds, failure to supply green food, carelessness in management resulting in foul quarters favorable to the increase of lice, mites and internal parasites which sap the vitality of the breeding birds, permitting conditions which invite disease such as drinking from barnyard pools or sink-drains, confinement in close, unventilated houses or in quarters where the fowls are subjected to chilling drafts of wind, to excessive cold or depressing heat, to extremely moist air, to mud or snow underfoot, to lack of sunshine, to conditions that tempt them to stand stupidly about rather than take necessary bodily exercise, any condition, in fact, which lessens the sturdiness of the breeding stock.

Trouble may come from carelessness in collecting the eggs after laying or in keeping them until incubation time. There is danger in over-heating or freezing, in keeping them in a place where a stagnant, humid atmosphere or foul odors can affect the eggs, in allowing them to age or permitting their contents to partly evaporate because of too dry or drafty atmosphere and in rough handling or jolting during transportation.

Errors during Incubation:—During the process of hatching, influences which tend to cause death in the shell, if they do not actually prevent hatching, may cause the death of the chick in the brooding period.

Some of these conditions or their indications are: Too high temperature of the egg at some time during the first week of incubation, too much ventilation or too little moisture in the air surrounding the eggs during the early stages of incubating, excess of moisture in the atmosphere about the eggs during the last week of incubation, too great difference between the temperature of the upper and lower parts of the egg.

These and any previously mentioned or other influences that cause over-stimulation or halting of the development of the blood-vessels, folding back of the net-work of veins at the borders or weak development and growth of the embryo in the egg may follow the chick in the brooder and defeat the purpose of the poultryman. Shells that are especially thick and hard or inner shell linings that are too tough, lack of proper temperature, and deficiency of ventilation or of moisture at hatching time may cause exhaustion, weakening, or crippling of the chick. Failure to properly enclose the yolk and heal the navel and delayed or dilatory hatching are signs of weakness.

If any one or several of these influences have resulted in the hatching of weaklings or of chicks defective in any way, apparent or nonapparent, the chances of satisfactory growth in the brooder are small. Success in brooding calls for whole, healthy, normally developed chicks in starting. Their heredity and hatching must be favorable to life and growth. The chick has a full chance only when its inheritances are of the best. Heredity is the foundation with prepotency for the corner-stone. The structure rising from this foundation because of life, shaped and cemented together by environment and the exercise of functions should not be disappointing.

BEGINNING BROODING.

After the chicks are hatched they should have no food given them for forty-eight, or better sixty, or best seventy hours.

The perfectly formed, properly hatched chick has, during the last stages of incubation, enclosed within its abdomen the yolk that remains and is thus provided with food sufficient for all meals during several days.

The yolk within the abdomen connects by what appears like a small, short tube with the intestinal canal. If a dead chick be opened and examined a day or two

after hatching it will be seen that the yellowish fluid of the yolk is passing from the yolk through the connecting tube into the digestive system and some of it appears to be working back to the gizzard.

This yolk nutriment is digested and furnishes sufficient sustenance for the chick during several days. The chicks are thus given ample opportunity to collect grains of sand or gravel and pass them down the digestive tract to the gizzard, there to be utilized as millstones for grinding the fibrous grains and other hard foods to be eaten later.

It is right to supply the chicks, immediately after hatching, with bright, attractive bits of grit for this purpose. Pure, fresh water may also be placed within reach and kept at hand so that they can drink at will. Simply grit and water is their proper fare for the first three days and by this seeming starvation is avoided the danger of digestive disorders which might have fatal results.

If through mistaken kindness the attendant begins feeding the chicks promptly after hatching, they are liable to get kernels of grain in the gizzard before the grinding stones are in place. Worse than this, if the digestive tract is filled with food eaten by the chick, the flow of the contents of the yolk into the intestinal canal is diminished or stopped. The yolk instead of dwindling to minute size or vanishing after a week or more, remains large, its contents ferment, and the chick suffers a lingering death.

The poultryman should satisfy himself by personal examination, as to these points. If chicks die or are killed by accident, open them and make a study of this matter of yolk absorption. The skin of the abdomen is easily torn open by the fingers and the yolk, intestines and gizzard exposed to view. If, after the chick is a week old, the yolk remains large and full or is distended with thin liquid and gases, fermentation has been producing poisons fatal to the chick's life. If after the chick is two weeks old, the yolk is not to be found or

appears as a little, shrivelled, hard, dark yellow or light brownish pellet of about the size of a pea, death has not come to the chick because of the yolk's non-absorption.

CHILLING THE CHICKS.

When eggs are hatched by the natural method, the mother hen, if left to herself will remain on the nest for a day or more, after the chicks are out of the shells. During the first days after leaving the nest she hovers her brood frequently, especially, if the weather is chilly. There is practically no danger of chilling the chicks. When artificially hatched there is no excuse for suffering them to get chilled.

That they will stand considerable change is abundantly proved by the fact that newly hatched chicks have been sent safely by express several thousands of miles during changeable spring weather.

Nevertheless, chilling of the chicks is to be carefully guarded against because when it does occur, it is usually fatal in its results. It is a cause of discomfort, induces crowding and piling up together, with resulting suffocation of the chicks that go under. Chilling is one of the most fruitful causes of diarrhea and other digestive disorders, of halting in growth, of irregular feathering and too often of lingering existence ending in a miserable death.

THE NATURAL METHOD OF BROODING.

Feeding the sitting hen with whole corn (maize) and allowing her to drink water while the chicks are coming out of the shells and for a day thereafter, will help to keep her contented and enable the chicks to get well dried off and strong upon their feet. The hen may usually be left to decide herself, when to come off with her brood.

She should not, and usually will not, lead her little ones far the first day after leaving the nest. She will scratch about, within a short distance of the nest and stop to hover her chicks frequently. The force of habit

may perhaps lead her to seek out her former range if it is not too distant. If she is inclined to wander too far or to travel too rapidly for the strength of her little ones, she should be somewhat restrained or watched.

The Freedom of the Place:—It is fortunate if the mother hen and her flock can be allowed to roam at will about the place or within a large enclosure free from serious danger of enemies and where there is grass land as well as tillage. It is only necessary then, to provide a simple shelter, where the hen may safely hover her brood at night or when the weather is unfavorable.

The mother hen should not be permitted to lead her chicks, while very young, into tall grass or growing grain wet with heavy dews or rain. The hen and chicks will obtain considerable food in the natural way by ranging and scratching for it. Seeds, grains, insects, worms, grubs and green grass obtained in small amounts at frequent intervals with the accompanying large amount of bodily exercise, conduce to healthy natural growth.

If necessary the supply of food may be supplemented especially towards sundown, so that the chicks shall close the day's foraging with full crops. Fresh drinking water should always be at hand, easily obtainable.

THE CHICK COOP.

Shelters for hens with chicks are simple affairs. Many broods have had for their homes common barrels or boxes. An empty barrel laid upon its side with one end open, the other end closed and raised several inches above the ground to prevent water from rains standing in it, has often been made to answer the purpose.

If there be danger of rats or other animals disturbing the hen or stealing the chicks at night the open end of the barrel may be protected by a frame covered with one-inch mesh wire netting.

Another plan is to make two coops of a barrel that has a good head and bottom by cutting the barrel into halves. After sawing it across at the middle, each half

is set upon its cut end. The coop thus made may be tilted on one side sufficiently to allow the hen and chicks



WHITE WYANDOTTE

Courtesy of H. H. Benjamin

to enter or pass out. By cutting one or two staves eight or ten inches above the ground, a little door may be

provided for entrance and exit. Inch holes bored in the staves near the top of the improvised coop allow of ventilation without strong drafts.

It is possible, in many places, to obtain empty dry goods boxes, grocery boxes or shoe boxes at small expense. These will furnish lumber for making coops which are both economical and effective. If the poultryman is not too particular he may, for example, take a common shoe box about four feet in length and nearly two feet in depth and width and make two coops of it. The box is sawed across the middle slanting so that when the two parts are set on their ends and the slanting part boarded, each coop has a single pitch roof. The boards which form the front of the coop as it stands after sawing, are taken to make the roof and if covered with tarred paper or roofing paper will shed rain water satisfactorily. A frame covered with lattice or with inch-mesh wire netting will answer for the front of the coop. A shelter board may be made for the front of the coop in case storms are liable to drive rain into the coop when it is occupied by the hen and chicks. Such a board is also useful to shade the coop from too hot sunshine if the hen is confined in it during sultry days in summer.

The common A shaped chicken coop, constructed of boards, makes a sensible and satisfactory shelter. Such coops may be made by anyone who can use a saw and hammer. The lumber of a dry goods box will supply the materials. Such a coop may well be made of separate parts and these parts fastened together by hooks and screw-eyes. The coop may be made of a size which allows of the use of the boards of the dry goods box to best advantage. It will not be far from right if, for instance its width at the ground, its height from ground to peak and its depth from front to back are each two and one-half feet. Two sides are made three feet by two and one-half feet. A triangular board back is made, three by three by two and one-half feet. A triangular frame of the same size, for the front is covered with vertical strips of lath or with wire netting.

These separate parts are placed in position and attached by screws or held firmly together by hooks and screw-eyes. When not in use the coop may be "knocked down," the parts packed together and stored in some convenient place, until again needed. A board platform is a good thing to provide for such a coop. It may be made three by three and one-half feet so as to project a foot in front of the coop. The front projection makes a good feeding and watering place. The flooring stops the entrance of rats, skunks, etc., by burrowing under the coop. It also prevents the hen (if she is inclined to scratch the earth too much) from covering her little chicks with soil and burying them alive. It keeps the coop dry under foot. If the hen is confined within the coop in the day-time it may be well to place it on the ground after the chicks get to running freely outside. A shelter for the front of the coop may be made of boards to use whenever protection is needed against storms, winds or sunshine. This may be three feet by three feet.

Ventilation of the coop is provided by the slatted or wire-covered front and by half inch or one inch holes bored in the back piece of the coop near the peak. If a larger hole is made for ventilation it should be covered with a piece of wire window screening to keep out rats. If the hen must be kept confined her quarters should be roomy and airy. If cats are likely to catch the chickens these sly enemies must be disabled or the chicks furnished with runs completely protected by wire netting. If a covered yard becomes necessary it should be as large as is conveniently possible. It is a good plan, usually to place several hens, with chicks hatched at about the same time, in coops quite near together, allowing the chicks to mingle freely. A large covered run will thus accommodate several broods and the hens will not be so likely to attack and destroy chicks of other broods than their own.

Sometimes frames eighteen inches or two feet high and of any convenient length and width are covered with wire netting and used as runs for the chicks. These

frames and the coops may be moved once a week or oftener so as to provide fresh ground for the chicks. Their runs should include both turf and tilled soil if possible. Thus they are able to get fresh growing grass for green food and can scratch in the fresh turned soil for grubs and worms. They also like to wallow in the mellow dirt and, by their dust baths, they reduce the chances of annoyance by body-lice. The chicks are allowed to run with the hen until well feathered.

ARTIFICIAL METHODS OF BROODING.

Whether hatched under hens or in machines, chicks may be brooded artificially. The essential requisite is to have them well hatched. If hatched by hens and it is desired to set the hens again on fresh eggs there is an evident advantage in having the means at hand for brooding the chicks artificially. Whether this shall be done by means of small indoor or outdoor machine mothers, by using a brooder house having hovers warmed by a hot water pipe system, by keeping the chicks in rooms heated by steam radiators (or stoves) or by any other method depends upon the poultryman, the location, the availabilities and the object in growing the chickens.

Whatever system is followed the essential factors, so far as shelter is concerned, are temperature, ventilation and moisture, which must, for successful brooding, be always under complete control.

To secure uninterrupted growth the chicks must be kept continuously comfortable, they must have abundance of pure air without direct drafts blowing upon them and the moisture of the atmosphere should be neither excessive nor deficient. Cleanliness in the brooding quarters is necessary. The banishment of mites, lice and disease germs is very important. Security, comfort and convenience are the attendant conditions of successful, satisfactory brooding of little chicks. We seek to secure by artificial means all of the essential, favorable conditions which attend a brood of chicks under the care of the mother hen, free to range out of

doors during the months of May or June in the temperate zone.

INDOOR AND OUTDOOR BROODERS.

It is not wise to place artificial brooders out doors until the weather is settled and comfortable. So-called "out-door brooders" are better placed indoors or under sufficient shelter for the comfort of the chicks and the convenience of their attendant. The shed or house or shelter of whatever kind need not be expensive but should protect from severe cold, storms, harsh winds and every discomfort of unfavorable weather. The chicks should be induced by conditions of comfort and attractiveness outside the brooder, to keep away from the hover and out of the confinement of the brooder as much as possible.

Individual brooders are usually warmed by means of hot water or hot air maintained at a sufficiently high temperature by means of lamps using kerosene oil. If the attendant can be at hand to look to the temperature, frequently, regulation can be maintained by increasing or reducing the lamp-flame according to the conditions. If the attendant must be absent for hours at a time automatic regulation should be secured by means of a thermostat as in the case of an incubator. In a cold climate or in cold weather a machine heated by hot water and ventilated by pure warmed air, having ample lamp power for both purposes and under complete control should shelter the chicks satisfactorily.

Avoid brooders that are too small, and such as have dark hovers and cold corners. Secure a machine having a safe lamp easily operated.

Use a new or certainly clean brooder, a clean lamp, fresh wick and good oil. If the brooder has been previously used, expose it, open to the air and sunshine out of doors, for a week before using it to brood chickens.

In-door brooders are intended for use only in brooder houses or where they are amply protected from uncomfortable weather. Out-door brooders may be used

outside when the season is sufficiently advanced and mild weather is prevailing.

STARTING AND RUNNING THE BROODERS.

About the time the eggs in the incubator are beginning to be pipped the heat should be started in the brooders or brooder house so that they may become well warmed and properly regulated by the time the chicks are ready for brooding. A temperature of about 90° at a height of two or three inches above the floor of the hover should be secured and maintained for the first week of brooding. Gradually the temperature is lowered until at the end of the second week it may stand at about 80° and at the end of the third week 70° should be sufficiently high. The chicks themselves will be the best indicators however and a temperature should be maintained which certainly keeps them comfortable.

Before the chicks are placed in the brooder, the floor of the hover or of the whole brooder may be covered with thick paper or several layers of newspapers. The purpose is to remove and replenish the floor paper when cleaning out the hover and brooder weekly. Upon the paper place two or three inches depth of sand or mellow sandy loam. Over this strew a layer of chaff, short cut straw or better fine cut clover hay or best of all alfalfa leaves one or two inches deep. The chicks having been kept comfortably under the sitting hens or in the nursery of the incubator for one, two or three days are ready for removal to the brooder.

If the chicks must be carried some distance in cold or windy weather provide baskets lined inside with flannel and furnished with covers. The chicks taken from the nursery of the incubator or from under the sitting hens are placed in the baskets, covered and carried quickly to the brooders. Here they are promptly placed about fifty in a lot, in the warm hovers. This may well be done in the morning.

Artificial Mothering:—For the following few hours the attendant should be at hand and watchful of the little fluffy fellows. The machine mother can not “cluck”

and the chicks have to be trained to go under the hover for warmth. The space allowed outside the hover, the first day should be small. A board set on edge in front of the hover and confining the chicks to a space within one foot of the hover curtain will be large enough. The chicks are thus prevented from wandering too far from the warm hover.

Sometimes, if no board confines them near the hover, they run out into the exercising compartment of the brooder and collect in a place that the sun shines upon, finding thus a pleasing substitute for the mother hen's hovering. When the sun moves away, however, the chicks are likely to stay in the same spot, having forgotten the warm hover. If they feel chilly they begin to crowd together and may pile upon each other in their efforts to keep warm by contact with one another. If this crowding continues some of the chicks are liable to go under and become suffocated or crushed to death. If this occurs in a corner of the brooder where there is the least chance to escape the crush, many of the chicks may become injured or killed.

Careful attention the first day easily prevents such accidents. The little chicks may be readily trained to run under the hover when they wish to warm up. Whenever they run out into the exercising space and begin to bunch together and crowd each other it is time to gently push them back under the hover. Repeating this operation a few times is all that is necessary to teach them the way to find warmth and comfort.

By the second day they should be well enough trained so that they may be given the run of the brooder.

After having learned where to find the warm hover it is desirable that they remain in it as little as possible, going there in the day time only to warm up when necessary. The temperature of the brooder outside the hover may well be kept high enough so that the chicks running about and scratching in the chaff and sand keep comfortable without hovering. To encourage this ac-

tivity of the chicks the brooding arrangements in cold weather may well include four degrees of shelter.

1. A hover artificially warmed and always of a temperature sufficiently high to take the place of the hovering hen.

2. A comfortable exercising space within the brooder or brooder-house.

3. An exercising place outside of the brooder or house but enclosed at the sides with boards one to two feet high and covered by a glass sash, such for example as is used for hot-beds. In this place on pleasant days even though the wind is blowing, the chicks may get the benefit of the direct sunshine.

4. An outdoor yard where the chicks can run and scratch in dry litter when the weather permits.

We thus give the chicks a choice of conditions that are attractive and inviting whatever kind of weather is prevailing.

Exercise, sunshine and fresh air are wonderful promoters of health, vigor and growth.

Ventilation:—The hover should be well ventilated if the chicks rest there through the nights.

A brooder is defective if it does not provide for the drawing in of fresh air which is then warmed and forced with a constant slow flow into the hover. The air of the hover carrying the products of the respiration of the chicks should be gradually but continuously moving out of the hover. This movement of air into and out of the hover, should be without direct drafts striking upon the chicks and causing them to catch cold. If a brooder has no system of forced ventilation its cover should be left partly open. If this tends to cool off the hover too much, at night, more heat must be supplied by a higher lamp flame. The chicks must certainly have fresh air and that without discomfort or danger.

Moisture:—Some thought should be given to the matter of moisture in the environment of the chicks. The extremes of dryness and wetness are to be avoided and a happy medium condition of humidity maintained if the birds in the brooder are to do their best. Stag-

nant moisture or excess of moisture in the atmosphere and under foot tends to decomposition and decay, to fungous growth, moldiness and the development of bad odors and filthiness. It favors the growth of disease germs. The chicks are liable to catch cold under such conditions and serious sickness may result. On the other hand excessive dryness of the air and especially of the floor boarding and of the sand upon it particularly if there is artificial heat beneath the flooring, tends to drying out and shrinking of the feet and shanks of the little chicks. It is an excellent plan to keep the sand of the brooder or of the exercising place outside the brooder, wet in one or more places. The chicks will spend some time standing or scratching in the moist spots if they find them attractive and the water continually evaporating will help to keep the atmosphere from getting too dry. Good ventilation should accompany moisture, causing it to keep in motion and preventing stagnation.

Cleanliness:—Watchfulness is necessary in the care of the brooders to avoid everything tending to unhealthy and unthrifty conditions. If a chick dies in the hot hover it should be quickly removed. The hover should have fine sand or sandy loam strewn on the floor daily. Once a week the brooder should be cleaned out and fresh litter put in. To destroy disease germs and parasites in the brooder use a spray pump or a whisk broom to sprinkle the interior parts with a two per cent. solution of carbolic acid or fumigate the empty, tightly closed brooder with burning brimstone.

On pleasant days remove the hover covers and lay them underside up, out of doors, in the sunshine, at mid-day for several hours. If body-lice get upon the chicks, dust them clear to the skin with fresh, fine Pyrethrum powder (Persian Insect Powder, obtainable at drug shops).

FEEDING LITTLE CHICKS.

White or bright chick grit, grains of coarse sand or fine gravel or granulated bone may be strewn on a-board

and placed in front of the hen sitting on the nest or upon the floor of the incubator nursery soon after the chicks are hatched. Drinking water in a shallow dish may also be placed where they can get to it. The dish may be partly covered or have a stone or piece of clean brick placed in it to prevent the chicks getting into the water or spilling it. As has already been stated no food need be given the chicks for the first three days of their lives because they have the egg-yolk enclosed within the abdomen and should draw from that all the nourishment they need for several days.

On the fourth day regular rations may begin. For the first two weeks feed frequently but not enough at one time to cram their crops except at the last feeding each day before they are hovered for the night.

The Foods:—The rations should surely include grains, green food, meat or other protein food and mineral food. The grain food may be wheat, Indian corn, oats, barley, millet, kafir corn, rice or such products as bread, crackers, corn cake and shredded wheat biscuit remnants. For green food there is nothing better than fresh growing grass, clover, alfalfa or young growing grain. Lettuce and cabbage leaves are excellent. Chopped onion tops and bulbs are good. In winter cured clover or alfalfa leaves are especially good substitutes for fresh grass. Protein or muscle-making food may be supplied in the form of hard-boiled eggs (tested out of the incubator), granulated beef scraps, animal meal, evaporated granulated butter milk, skim milk curds (cottage cheese) or finely cut fresh bone.

Mineral food is supplied to some extent by the ash constituents of the grains and green foods but large amounts of phosphate of lime are needed in forming the skeletons of the growing chicks and this is amply supplied by providing grit in the form of granulated bone or by feeding fresh cut bone.

Balancing the Ration:—In order to promote the best growth of the chicks they should be supplied with rations which furnish the nutrients for growing flesh, bone, nerves, brains, etc., in the right proportions. If

the rations are not balanced not only is there failure to make the best growth but digestive disorders are likely to result. A mixture of dry feed-stuffs balanced for feeding to growing chicks may, for example, be composed of wheat 3 lbs., Indian corn 3 lbs., beef scraps (containing 50 per cent of digestible protein) 2 lbs., clover hay 2 lbs. Here in ten pounds of feed are six pounds of grains, two pounds of meat food and two pounds of (dried) green food. Other grains may take the place of the wheat or corn without very much disturbing the balance. The feed-stuffs should be wholesome and palatable, never fermented, musty or decayed.

Methods of Feeding:—Whatever the feeds or manner of feeding, fresh water and grit should be always at hand. Granulated bone-charcoal or wood-charcoal may also be kept before the chicks. Green food is furnished by the clover or alfalfa leaves, chaff or finely cut hay strewn on the sand in the brooder, if green grass is out of season. Cut clover or alfalfa or alfalfa meal may be kept in a hopper before the chicks.

During the early days of brooding cracked wheat, finely cracked corn, coarse oatmeal, oat flakes, millet, or broken rice may be scattered in the chaff, or placed on boards in the exercising compartment of the brooder or within reach of the chicks if they are brooded by a hen. Eggs that failed to hatch may be boiled, cut fine, shells and all and given to the chicks. By the beginning of the second week, beef scraps may take the place of the eggs. By this time the chicks will also be ready to eat whole wheat. While it is well daily to scatter some of the grains or seeds in the chaff or about the runs to induce the chicks to hunt and scratch for a part of their living the major part of the rations may be fed in hoppers. These are made of galvanized iron or of thin boards and provide compartments for each kind of feed-stuff used, besides granulated bone or other grit, granulated bone charcoal or wood charcoal and crushed oyster shells. The hopper is hung against the wall of the brooder or brooder house high enough for easy

feeding. Wire netting of one-inch mesh may be placed over the feed box of the hopper to prevent the birds scattering the feeds. By this plan the chicks can soon be trained to balance their own rations, without over eating of any one kind of food.

No wet soft foods are given them. By taking their rations in natural dry forms the gizzard is compelled to fulfil its function and grind the feed to pulp. The food being balanced does not cause over working of the liver and digestive disorders are avoided.



LIGHT BRAHMA

Courtesy Bradbury & Bradbury

CHAPTER V

Growing Chickens

The management of growing chickens depends very much upon what disposition is to be made of them and the time of their disposal. It is possible to force the growth of the chicks during the first two months of their lives and then market them as "squab-broilers," weighing from one-half pound to one and one-half pounds each. In the great cities, at certain seasons, these tender chicks, if plump, are in good demand in club-houses, high class hotels and restaurants and bring excellent prices.

Spring broilers are marketed later in the season. These should be grown until they weigh dressed, two pounds each. There is very little market demand for chickens weighing two and one-half pounds each. After the birds attain a weight of three pounds they become salable as small roasters. There is a yet better demand for roasters of four to six pounds weight and considerable call for well finished fowl weighing from six to twelve pounds. Many pullet chicks are grown for layers to take the place of the older hens which are usually sold after two seasons, sometimes after one season, if not laying. A large number of fowls are grown to maturity and used or sold for breeding stock. Not a few birds are grown for exhibition purposes.

SQUAB-BROILER CHICKS.

Chicks intended for marketing at eight to ten weeks old, weighing one and one-half to two pounds to the pair are usually hatched in December and January and confined in brooders until fitted for sale. White Leghorns, White Wyandottes and Rhode Island Reds are favorite varieties for this special purpose because their chicks grow rapidly and promptly cover the breast and

shanks with toothsome flesh. Arrangements are made so that consecutive hatches, at regular intervals, shall supply a sufficient number of chicks to fill the brooders and meet the orders without delay. The treatment of the chicks in the brooding pens is such as has already been described in the chapter on Brooding, except that their exercising place is somewhat more restricted and they are induced to eat all the food that they can readily digest. The temperature of the air around them must always be under control and completely comfortable.

It is practicable to take an old farm house or any tightly constructed building, place in it a modern steam heating system and use the rooms for growing squab-broiler chicks. Several layers of building paper or newspapers are placed upon the floors and over these is spread a few inches depth of sand. Upon the sand is strewn a layer several inches deep of chaff, short cut hay clover, alfalfa or straw. Radiators or coils of iron piping convey the steam heat to the rooms and keep the brooding quarters at the desired temperature. If the warmth is always sufficient no hovers or enclosed brooding boxes are needed. If there is any danger of the temperature falling during the night so that the chicks, hovering on the littered floors of the rooms, will be uncomfortable or chilly the steam heater should be of larger size. The heating power ought to be sufficient to maintain a comfortable temperature surrounding the chicks throughout the coldest, windiest, stormiest night of the winter. In case the temperature of the rooms is not sufficiently high in extremely cold weather, simple hovers made of empty soap boxes, carrying pails of hot water, may be used to supply extra warmth.

HOME MADE HOVER.

A supplementary hover is easily constructed by taking a good empty soap-box, removing the top and any nails that stick out on the upper side, turning the box bottom side up, and cutting a round hole in the top of sufficient size to receive and hold a water pail of ordinary size, letting the bottom of the pail down into the

box to within about three inches of the floor. Pails made of wood-fiber hold the heat better than metal pails and give out the warmth of the hot water gradually to the little chicks which hover beneath and around the filled pails. A board cover is made to fit closely the top of the pail. A little chick-door, cut in the side of the box allows the chicks to go in and out of the hover at pleasure. Several half-inch holes cut in the front side of the box near the top will help to give needed ventilation. If it is desired to use a thermometer in the hover, one may be inserted through a hole made in the side or top of the box, letting the bulb of the thermometer come about three inches above the hover floor.

If necessary a larger box may be used and two pails of water set into its top. The water used to fill the pails should be of a temperature of 140 to 160 degrees and one filling will usually maintain the desired warmth of the hover through the night. If necessary, on very cold nights, papers or blankets may be used to cover over the pails and the back and ends of the hover but the front should be left uncovered to ensure sufficient ventilation. If the room outside the hover is chilly at night the chick door should be nearly closed so as to prevent any of the chicks coming out and failing to return to the warm hover. If, however, the room is abundantly warm, the chicks may be shut out of the hovers and compelled to hover in the chaff where the air is less confined than in the box hovers.

DOUBLE-DECKER BROODERS.

If more room for chicks is needed, than is furnished by the floor pens, it is practicable to construct board platforms three feet above the floor. Each platform may be made three by seven feet, allowing about three square feet at one end for a home-made hover and leaving an exercising space of about three by six feet. These platforms may be arranged in continuous rows with paths between, two and one-half or three feet wide, to enable the attendant to easily manage the broods. The elevated platforms have sides eight to twelve inches high

of boards and the tops are protected by wire netting. The youngest chicks are brooded on these platforms until about three weeks old. They are then transferred to the floor pens underneath the platforms. The latter are cleaned, the sand and chaff renewed and newly hatched chicks placed in the hovers. The frequently renewed sand and chaff keep the pens dry and clean under foot. By scattering dry granulated or cracked grains and seeds in the litter, the chicks are encouraged to scratch for a part of their living, thereby ensuring the taking of sufficient exercise for healthy circulation of blood and good growth of body.

FEEDING AND FINISHING.

Add fresh chaff or other litter daily and replace the surface layer of sand and the broken litter weekly. Pure water is renewed in the fountains frequently enough to keep before the chicks an ample supply in fresh palatable condition. Plenty of grit (granulated bone is best) and granulated charcoal of bone or wood should be kept in a hopper always conveniently at hand. A good growing ration, well balanced, as described in the previous chapter (IV, Brooding), is supplied and the chicks induced to eat all they can well digest.

Green food may be supplied in the form of sprouting oats, lettuce leaves, cabbage, chopped onions or onion sprouts, fresh cut apples or, lacking actual green food, use may be made of cured alfalfa or clover leaves.

The chicks if properly hatched from eggs of a suitable breed and vigorous stock should thrive and grow rapidly in the well lighted, airy quarters, enjoying a comfortable temperature day and night, generous but careful feeding, reasonable and not excessive exercise, proper ventilation and cleanliness (preventing foul air and filthiness under foot) and healthiness because of the banishment of parasites and disease germs.

Before killing, the plump chicks are kept without food or water for twenty-four hours in a pen or coop where there is no chaff or litter on the floor. They are bled through the mouth, carefully picked to avoid any

tearing of the tender skin and thoroughly cooled. They are not drawn and the heads are not removed. Any blood on the beak is sponged off. After all the body-heat has escaped the broilers are packed in a clean box of suitable size, alternating the layers of chicks laid on their sides, spoon-fashion close together, with layers of bright clean straw, if the weather is cool enough to ship without ice. If the weather is warm, cracked ice is used between the layers of broilers. Pack closely so that there will be no shifting and consequent bruising of the birds. Nail or fasten the cover on tight. Write plainly on the package the address of the customer and of the shipper. Also write a letter to the customer advising him of the time of shipping and the contents of the package.

SPRING BROILERS.

Hatching of chicks for spring broilers usually begins in January or February. White Wyandottes are a favorite variety for this purpose on account of their maturing early and making plump breasted broilers. The plan is to grow the chicks to about two pounds dressed weight. The directions given for the management of brooder chicks in Chapter IV will suit the needs of chicks intended to be sold as spring broilers. These chicks may have somewhat more exercising room than the squab-broiler chicks but should be confined within the brooder runs. Their feeding may be less forcing than that of squab-broilers because a longer time is taken for their growth and all risk of inducing leg weakness or indigestion should be avoided. They should however, be kept growing steadily and without halting come to a plump condition and be ready for marketing by the time they are twelve to fifteen weeks old. They are finished off, fasted, killed, prepared for market and shipped as described for squab-broiler chicks.

BEARING CHICKS AFTER BROODING.

In growing cockerels to be marketed in autumn or early winter as roasters, in raising cockerels and pul-

lets for breeding or exhibition stock and in developing pullets for laying flocks, the management of the chickens may be alike for several months after they pass the brooding period. As soon as the sexes can be determined, the cockerel chicks should be separated from the pullet chicks and the two sexes thereafter colonized in separate flocks.

Separating the Sexes.—It is easy to determine the sex of chicks of the Leghorn and other Mediterranean breeds, at eight weeks old. The combs of the male chicks usually show conspicuously because of larger size and brighter red color than the combs of the female chicks. The little cockerels are also more obstreperous and eager for mock fights than their sister chicks. The latter, however, oftentimes develop the wing and tail feathers faster than the little cockerels. Chicks of the American class of breeds, such as the Plymouth Rocks, Wyandottes and Rhode Island Reds, are slower than the Leghorns in showing sex characteristics. The cockerel chicks at ten to twelve weeks old, should average a little larger and somewhat coarser than the pullet chicks. The Brahmas and other Asiatics may not show distinct differences between the sexes of the chicks until they are fifteen weeks old and even at that age, it is frequently difficult to separate them according to sexes. By this time however, the shanks and toes of the cockerel chicks should appear larger in size than those of the pullet chicks. The voice of the chick is usually a good indication of its sex. Taking a chick in the hand and removing a short distance from the brood, will commonly cause emphatic peeping by the prisoner. If a male chick the voice will usually be coarser and deeper in tone than that of a female chick, which latter is likely to be fine in tone and high of pitch. The interested poultryman, attending daily to the wants of his broods gradually learns to note these and many minor differences between the cockerel and pullet chicks. After one or two seasons' experience, he is able, without difficulty to distinguish the sexes during the brooding period.

Weaning the Chicks.—When chicks are brooded by

the mother hen she may, in most cases, be permitted to leave her chicks when it suits her best. In artificial rearing of the chicks, the time for changing from the brooder having a heated hover, to the unheated colony house, depends very much on the season and the prevailing weather, somewhat also on the location and the conditions of shelter and furthermore on the extent to which the chicks are feathered out and the kind of care they will receive. If the change is made in early spring, the chicks should, in their new quarters, be amply protected from storms, chilly winds and dampness. If the change occurs in sultry weather, the chicks should not be confined in close, hot quarters, during either day or night. Chicks will bear considerable moisture if there is no chilliness accompanying it. They will stand considerable cold if the air is not humid. The combination of wetness and chilliness, however, is unbearable. The only safe rule is to keep the chicks comfortable.

Culling the Cockerels.—The poultryman may see fit to cull out the cockerel chicks that he does not care to raise and sell them as broilers. This plan saves considerable feed and care and the birds will usually sell for a sum sufficient to pay for the growing of the pullet chicks to laying age. Cockerel chicks that are intended to be grown to roaster age, may be caponized when two to three months old according to directions to be given later in this chapter. Selection of birds which promise to be of value, as special breeders or for exhibition purposes may be made at any time. Such birds are given especial attention and care under conditions as favorable as possible to the development of their fine qualities. Sometimes it works well to select one or two very promising cockerels and place them in pullet flocks. They thus escape any quarrels likely to occur among their fellows and by association with the pullets they tend to develop more rapidly and successfully, their fine qualities for exhibition purposes.

COLONIZING THE CHICKENS.

The ideal method of growing chicks after they have

been removed from the brooders and separated into flocks according to sex, is to colonize them on turf or tillage land where they can have free range. This plan saves the expense and inconvenience of fencing. The chickens obtain a good part of their living by foraging. The fresh air, sunshine, green grass, insect-food and outdoor exercise are all favorable to uninterrupted thrifty growth. Each flock should consist of fifty to one hundred chicks of one breed, of about the same age and of like degree of growth and vigor. If they must be confined by fences the yards should be made as large as practicable so that the birds will not feel the restraint. The enclosure should include both grass land and plowed land. If the poultryman can allow only small yards for his growing chickens, the ground should be freshened frequently by cultivation and cropping. It is well to divide the yard space for each flock by a middle fence, thus providing double yards. While the chicks are occupying one yard, grain may be growing in the other which in its turn is occupied by the flock.

If dogs, cats, hawks or other enemies are likely to invade the enclosures it may become necessary to make the yards narrow and cover them with poultry netting. Shade should be provided by means of trees to protect the fowls in summer from the fierce rays of the mid-day sun. If the farm orchard is available it provides very desirable conditions for the growing chicks. The occasional cultivation of the soil under the trees is favorable to their growth and gives the chicks fresh soil to scratch in. The chicks destroy many insect enemies of the fruit trees and their droppings furnish the best of fertilizer for promoting the growth of the apple, pear, plum, peach or other kinds of fruit trees. The chickens appreciate and enjoy the shade of the orchard and frequently prefer to roost in the trees at night rather than stay in houses that lack the pure air, cleanliness and freedom from insect pests of the natural perches. If trees are lacking for the colonies on free range, it may be practicable to plant continuous rows or drills of Indian corn in strips two or three rods wide between the ranges.

The rapidly growing corn supplies desirable shade and also helps to keep the independent flocks secluded from one another. Further a considerable crop of grain for winter feeding may thus be obtained. If neither trees nor growing crops can be conveniently provided, screens may be made of the boughs of trees in full leaf or of burlap sacking or cotton cloth, tacked upon frames, supported by posts about two feet high above the ground. These retreats will furnish not only shade but also protection from hawks if these enemies are prevalent.

CHICKEN COLONY HOUSES.

Some simple, suitable shelter is desirable whether the chicks are kept on free farm range or within fenced parks or yards. In some cases the chicks, having been protected by means of comfortably heated brooders in the shelter of sheds or small houses, the first step after brooding age is to remove the brooders and still allow the chicks the use of the brooders. The next step is to take the brooder away, place perches in the shed or house and permit the chicks to occupy these quarters. If the house is portable it may be moved to the pasture or other part of the farm where the chicks are to have their range. Good colony coops may be made out of piano boxes. In localities where rye straw is readily grown or easily obtainable, small colony houses may be made of poles, poultry netting and thatch. A frame of poles or joists is made, forming the skeleton of the house. Poles or thin strips of board are laid on the rafters and sides to support the thatch. Small sheaves of straight straw are laid on the roof and sides, lapped like shingles and thick enough to shed rain water. The thatch is fastened on to the frame work by strands of tarred rope. The front of the structure may be left open or can be protected when necessary by a frame covered with wire netting or cotton cloth or both.

Shelter, shade, comfort, coolness, ventilation and attractive appearance may thus be easily and economically provided by the right combination of a few poles, some sheaves of straw, a pound of nails, a few strands of rope

and a little labor. If preferred chicken colony houses may be constructed of lumber, each provided with a door, a window and a ventilator. A floor is made of matched boards. The roof is covered with shingles or roofing paper. Perches placed about eighteen inches above the floor and fifteen inches apart leave little room except for the feed and grit hoppers and water fountain. Such a house eight feet square will shelter one hundred growing chicks nicely during the night-time and when the weather is stormy or uncomfortable out of doors. Such houses being portable may be used on the range in summer and brought in to be grouped in a sheltered location for use in winter. The house may have frames of wire netting made to fit its door-way, window-frame and ventilator space so that it may be safely closed at night and yet allow full and free circulation of air for the chickens on the perches. If rain storms are liable to drive in and drench the fowls, when on the roosts, the regular board door may be closed and the window sash or a board shutter or a frame of burlap or a curtain of cotton cloth be used to fill the window space. The ventilator may be placed in the front near the top of the house and should have a board cover, which when well opened forms an awning over the ventilator opening, thus preventing rains from driving in upon the chickens. More complete details of the plan of this kind of chicken house will be given in the chapter on poultry buildings. Such a house is easily kept clean. Fresh loam may be thrown upon the droppings over the board floor every morning and all cleaned out weekly. When the chicks are first placed in the colony houses care should be taken to induce them to use the perches at night and not hover in the corners on the floor.

Lift the ends of the perches from their supports occasionally and search for insect parasites. If mites should be found, remove all the furnishings, clean the floor and spray all of the interior surfaces with a two per cent. solution of carbolic acid (two parts carbolic acid to ninety-eight parts of water). Also saturate the furnishings thoroughly with the solution before return-

ing them to the house. Repeat this operation frequently enough to subdue and banish the pests. If necessary use a five per cent. solution to annihilate the parasites. See that the chickens have a sheltered wallowing place in mellow soil, where the sunshine makes it inviting. One trip daily with a horse and wagon will enable the poultryman to drive from colony to colony, fill the water fountains, replenish the feed hoppers and strew dry soil on the house floors. The plan of supplying granulated bone, dry grains and beef scraps or evaporated



EGG TESTER

Bicycle Lamp and Galvanized Iron Cylinder—See page 53

buttermilk freely in the hoppers allows the chickens to balance their own rations. If extra large hoppers are used, filling them weekly may suffice. If a stream of water or a system of pipes provides fresh, running drinking water, so much the better. Occasionally visit the houses after sunset and listen to the breathing of the birds. If there is any wheezing or sign of difficult breathing remove the bird that shows such indication of throat or lung trouble. Count up the chickens of each colony every few days and if any are missing, find

out, if possible where they are or what has caused their disappearance.

PREPARING THE PULLETS.

For Exhibition.—Any particularly, promising pullets that are wanted for exhibiting in the autumn poultry shows, may be selected from the flocks and kept by themselves. They should not be pushed in growth so as to actually begin laying before exhibition because egg production causes detracting of exhibition qualities. The pullet has a fine, glossy plumage and is in the pink of condition for exhibiting just as she comes to the period of egg-production. If she begins laying, however, the glossiness and smoothness of her feathers diminish and she loses somewhat of the comeliness and symmetry which count for so much in the winning of prizes at poultry shows. If the pullet searches for a nesting place or tries to begin egg-laying, change her quarters to some place that is cooler and darker than her previous abode. Give her only enough food to keep up body and plumage condition. Omit from her rations meat, fresh cut bone, blood-meal and other feed stuffs that tend to hasten egg-production. Use no condiments.

For Laying.—Pullets of the Mediterranean breeds, like the Leghorns, will often be prepared to produce eggs at five to six months of age. The Rhode Island Reds, and Wyandottes will sometimes lay at six months while the Plymouth Rocks wait usually until they are eight months old before laying. The Asiatics, including the Brahmas, Cochins and Langshans take ten to twelve months to mature and prepare for breeding. Chicks of the early maturing breeds, hatched in March or April may be managed so that they will begin laying in October by keeping them continually comfortable under the conditions of the colony system on free range and, as they approach maturity, feeding them balanced laying rations including fresh-cut bone, beef scraps, granulated milk or other feed stuff containing considerable digestible protein for the maturing of normal, healthy perfect bones, muscles, nerves, heart and blood-

vessels, lungs, digestive system, breeding organs and the albumen or "white" and the yolk of the eggs. As the pullets grow in size, if they begin to become crowded in the colony houses at night, divide the flocks so as to give the birds plenty of room. Keep them comfortable in every way but do not tempt them to form habits of idleness. Encourage their foraging, if necessary, by occasionally scattering grains widely over their grassy ranges. See that they are not compelled to endure pelt-ing storms, harsh winds, chilliness, dampness, foulness, impure air, unwholesome food, or filthy or stagnant drinking water. Let the pullets remain on free range as long as practicable before laying, then remove to the quarters which will be their home through the fall and winter. If by forcing the growth and feeding stimulating rations the pullets are induced to begin laying early in September, their bodies are liable to be stunted, their eggs small and laying to be interrupted by a fall molting of the feathers. In such cases the fowls do not ordinarily renew egg-production until the following spring season. Steady growth, maturing and perfecting all parts of the pullet and of her breeding organs, will prepare her for egg-production which, beginning in October, should continue under favorable conditions through the autumn, winter and following spring. If pullets are to be selected for future breeders, their egg-laying records should be carefully kept, as already suggested, during their first laying season.

SOFT ROASTERS.

Sometimes it is wise to depart from the usual custom and do things differently from the ordinary way. Chickens hatched in spring, reared through the summer and marketed in the autumn, commonly bring only ordinary prices, the supplies of dressed poultry for the holiday trade being usually very abundant. In some localities it is practicable to procure a profit by reversing the usual order of poultry practice. Chicks may be hatched in late summer and early autumn, brooded during the fall, grown through the winter and sold as soft

roasters (both cockerels and pullets) in the spring. Light Brahmas and White Plymouth Rocks are favorite fowls for use in carrying out this plan. It is more difficult to obtain good eggs for incubating in the summer and hatching is more difficult than in the natural nesting season of spring but these difficulties can be managed. Hatching machines are used to bring out the chicks in large numbers and these are cared for in brooder houses warmed by pipe-systems of hot water or steam. These houses should have been cleaned out thoroughly and disinfected several months before autumn use. They should, in fact, have been left empty and open to the air and sunshine, unused, through the summer months. Any good system of brooding that insures complete control of the temperature and other conditions surrounding the chicks will answer. After the brooding period is over, the chickens are separated into flocks according to sex and provided with colony houses holding each a flock of about thirty birds and providing about two square feet of floor space per fowl. The cockerels should be caponized or castrated.

CAPONIZING.

Caponizing is the removal of the generative organs of the male chicken, thereby destroying his power to breed.

The Capon.—The cockerel so emasculated is termed a capon. He becomes very docile and slow of movement, loses all inclination for fighting or quarreling with his fellows and is contented to keep his own company. The spurs keep growing but the comb and wattles diminish rather than increase in size. They also lose their bright red color. The flesh of the capon remains tender. If given sufficient time he grows to much larger size than he would if not caponized. He fattens readily and produces a plump, juicy, sweet flavored, fine grained table fowl. He commands a higher price in the market than if not caponized. Well matured capons often develop a beautiful glossiness of plumage, which added to their majestic mien gives them a very attractive appearance.

Capons sometimes become so motherly in their manners that they are used for brooding chickens. They succeed admirably in fulfilling the mission of the broody hen. Capons are readily restrained within limited quarters and seem to devote their energies almost entirely to eating, digesting and growing. The American and Asiatic breeds of poultry furnish chickens that are well suited for making capons. The Plymouth Rocks, Rhode Island Reds and Light Brahmas make especially nice capons. The qualities of early maturing and easily fattening are particularly favorable to the production of plump, profitable capons. An especially desirable characteristic is that the ribs of the bird shall have ample spaces between them.

The Caponizing Instruments.—A set of modern instruments for performing the operation of caponizing includes the following:

1. An operating stand or easel for holding the chicken while being caponized. The board on which the bird is placed should be about two feet by three feet and have half-inch holes through which are passed the cords holding the wings and legs of the chicken. The board may have its corners rounded or be made in the form of an ellipse if so desired. Some operators use the top of a flour barrel for a caponizing table.

2. Two strong cords, one to fasten about the wings near the body, and the other to fasten around the legs just above the hocks. The ends of the cords pass through holes in the operating board and are held taught by weights.

3. A sharp thin steel blade for cutting through the side of the chicken. The handle of this blade may be of two pieces forming a pair of forceps.

4. A spring spreader for holding open the sides of the incision made between the ribs.

5. A probe for use, if needed, in pushing away the intestines so that a clear view and room for operating are secured.

6. A twisting spoon or scoop and hook. These two instruments may be separate or the hook may be placed at the end of the handle of the spoon.

Some caponizing sets include a canula and horse hair or fine wire in place of the twisting spoon. The twisting spoon or scoop which gathers the testicle, has a slit in the middle into which the cord attaching the testicle to the body of the chick, should slip before the spoon is turned. In one form of spoon or scoop, a clipping knife operates in the hollow of the spoon across this slit, severing the cord and doing away with the necessity of twisting and tearing in the removal of the organ. A bottle containing a few ounces of carbolic acid and a package of absorbent cotton complete the outfit.

The Operation of Caponizing.—Whatever the season of the year, the cockerel chickens to be operated upon should be from two to three months of age and weigh from one and one-half to two pounds. The organs of reproduction will each be about one-half inch in length and one-fourth inch in width, shaped somewhat like a kidney-bean. For thirty-six hours before operating, the chickens should be kept in a clean coop having a slatted or board floor and should have absolutely no food or water. The purpose of this day and a half of abstinence from eating and drinking, is to reduce the size of the intestines and thus give room for using the instruments and seeing clearly the parts involved in the operation. Operate only in direct sunshine or in very powerful artificial light. In caponizing by electric or acetylene light, a visor with a reflector is sometimes worn by the operator, to throw the light directly upon the organs to be removed. The chicken is fastened to the operating board by folding a cord twice around the base of the wings and another cord twice around the legs just above the hocks and passing the cords through holes in the board so placed that the chicken will be held with his right side up. Weights attached to the ends of the cords beneath the operating board hold the cords taught and prevent the bird from moving to any troublesome degree. The board with the bird upon it is canted or placed at the right height for easy operating and in position so that the sun will shine down directly and squarely upon the

operation. The feathers forward of the bird's right hip are dampened with a little water and parted at the space between the first and second ribs next to the hip. A few of the feathers here may be plucked if necessary to expose the skin at this place. The skin is drawn back over the hip by the fingers of one hand while those of the other hand find the space between the first and second ribs about one inch below the back bone. The steel blade is used to make an incision parallel with and between these two ribs. Do not thrust the point of the blade in so deep as to puncture the bowels or diaphragm. Avoid cutting into the lungs which are just forward of the diaphragm, close up against the back bone. The spreader is inserted to hold apart the sides of the opening between the ribs. If necessary the opening is enlarged by using the steel blade to cut upward or downward along the ribs but do not cut close up to the spinal column.

The little hook or the hook end of the twisting spoon is used to catch into the thin, transparent film of membrane which surrounds the abdominal cavity. This lining is torn open so that the operator can see into the cavity. The two testacles lie near the back bone, attached by fine cords very close to a large artery. With the sun shining directly into the cavity one testacle should be plainly visible, partially hiding the one below it. The twisting spoon is inserted, pushed down and passed under the lower lying testacle. Having gathered it into the hollow of the spoon, its cord should slip into the slit in the middle of the spoon. By turning and drawing the spoon the cord attachment is twisted apart and the testacle is then removed from the cavity. The spoon is again inserted and the remaining testacle removed in like manner. If a spoon with a clipping knife is used the cord attachment is cut and the testacle removed without twisting the spoon. If the canula and horse hair or fine wire is used the testacle is caught at the end of the canula by the loop of hair or wire and then by twisting the firmly held canula, the organ is torn from its attachment and removed. If the testacle

should be too large to be removed at one operation the spoon should be used to gather any fragment that remains. If any part remains it may grow again and the bird retain breeding power. If the castration is not complete the creature is termed a "slip."

Removing the spreader, the opening in the side of the chicken closes and the skin which in the first of the operation had been drawn back over the hip, slips forward so that the incision between the ribs is covered by whole skin. The wound in the skin itself lies forward of the incision between the ribs. The bird is released and may be fed and watered immediately. He has not noticed much about the operation except when the blade cut the surface skin. When put down he begins to eat and appears as hearty as ever. Sometimes the skin over the incision puffs up, after a day or two. A needle run under the sound skin to the puffed place will let out the gas and there will be no further trouble.

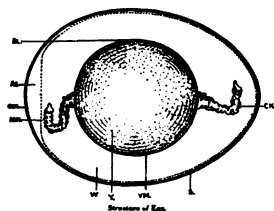
If in operating, any small veins or arteries are severed there will be some bleeding. The blood is readily removed by the spoon or by absorbent cotton, if it interferes with operating. If the large artery between the organs and the back bone is ruptured the chicken will flutter and quickly bleed to death. In this case the bird should be promptly plucked and dressed for table use. Skill is quickly gained by practice so that chickens may be caponized very rapidly without making slips or causing death. The instruments should, after using, be immediately cleansed and sterilized with a one per cent. solution of carbolic acid.

Spaying is the operation by which the ovary of the pullet chicken is removed but this is rarely practiced and is not necessary in producing pullets for market.

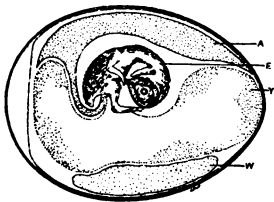
FEEDING THE CAPONS AND PULLETS.

Dry feed in hoppers is the method followed, tending to healthy digestion, uninterrupted growth, plumpness of flesh and sufficient fatness by marketing time, all with reasonable economy of feed-stuffs and saving of labor in caring for the chickens. Grit and fresh pure

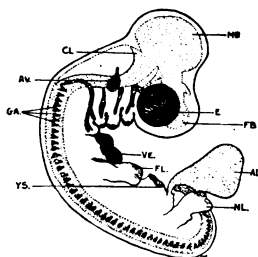
drinking water are, of course, kept at hand. The growing chickens are free to exercise a reasonable amount but capons are quiet creatures and pullets likewise. They balance their own rations at the hoppers in which they find Indian corn or other grains and beef scraps or other protein food. Cabbages hanging by their stems furnish green food and some exercise in jumping for it. In winter mangolds or stock beets are good to supply green food or lacking these, alfalfa or clover hay, especially the leafy parts, provide an excellent substitute for green food. The alfalfa or clover may be fed cut fine or as meal, placed in feeders or hoppers protected by inch-mesh wire netting so that the birds can not scatter it out. Just before the pullets would begin to lay eggs they should be slaughtered and dressed for market. Both the capons and the pullets are sold as "soft roasters," from March to June, when such fowl are scarce in the markets. These choice table chickens command excellent prices. Rightly managed they should prove very profitable.



Structure of Egg



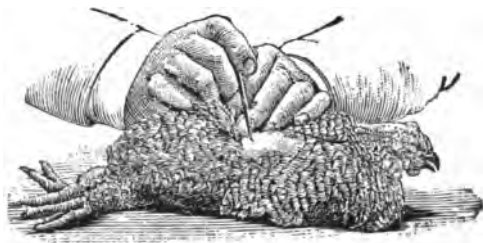
Section of Egg with Five Day Embryo.



Section of Five Day Embryo.
Drawing by Fred Lathrop

KEY

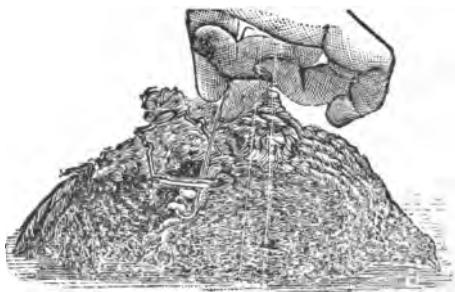
- | | |
|-------------------------------|---------------------------|
| As—Air space. | ISM—Inner shell membrane. |
| A and Al—Allantois. | MB—Mid-brain |
| AV—Auditory vesicle | NL—Leg. |
| BL—Blastoderm | OSM—Outer shell membrane |
| CH—Chalazae. | S—Shell. |
| CL—Cerebrillum. | VE—Ventricle. |
| E—Embryo; also Eye in Section | VM—Vitelline membrane |
| FB—Fore brain. | W—White of egg. |
| FL—Wing. | Y—Yolk. |
| GA—Ganglia. | YS—Yolk stalk (cut) |



Making the incision



Using the scoop-twister



Catching the lower or left testicle in the scoop

CAPONIZING

Courtesy of W. H. Wigmore

CHAPTER VI

Foods and Feeding

The hopes of the poultryman and the pleasures and profits of poultry-keeping depend, in very large degree, on the abounding life of the birds of the flocks.

Hens like human beings may of dust be made and to dust eventually return but, betweenwhiles, both kinds of bipeds are very much alive. Beginning with the development of the embryo chick within the egg, there is continuous change, ceaseless movement, growing, wearing, wasting, repairing, heating, producing until the time of the creature's death.

Consider one item—that of body warmth. From the time the egg begins to be incubated until the chicken's career is ended, there must be maintained throughout the creature's body a temperature of about 105° F. and this whether the temperature surrounding the fowl is at summer heat, or far below freezing. Any serious variation from this degree of natural animal heat in the body of the bird is a sign of the passing of life and the coming of death.

THE LIFE BLOOD.

In order that the body may be maintained and growth or production take place, the heart and circulating vessels are ever at work, pumping the blood through the body, carrying the fresh materials to the parts for increase or repair and removing the wastes of wearing and renewal.

The red blood contains all the elements composing the parts of the fowl. It is the source of supply for the making and replenishing of the bones, muscles, brains, nerves and all the tissues, for the forming of the feathers and the producing of the eggs.

The blood is almost four-fifths water, which acts as

solvent and carrier of the compounds used by the bird's body in all its life processes.

To keep up the supply of the life liquid, fresh materials must be frequently furnished.

NUTRITION.

Water to drink and food to eat, supply the raw materials which by the processes of digestion and assimilation constantly replenish the blood.

Nature has provided the fowl with a series of organs wonderfully well adapted for extracting from many kinds of food, the nutrients which give to the blood its life sustaining qualities.

The poultryman who is determined to know as much as possible about his fowls may learn, at first hand, many important points regarding their nutrition. Let him take a chicken and kill it by a blow on the head so that the blood will remain in the arteries and veins of the circulatory system. Then commencing at the head carefully cut out the digestive tract from beginning to end. At the same time examine and study the successive parts and the contiguous organs as to their appearance and the purposes they fulfill in the fowl's internal anatomy.

If this form of object lesson is studied in very cold weather a bird's body may, after death, be frozen stiff and solid. Then with a saw it may be cut lengthwise of the body a little to one side of the mid-line along the back bone and the breast bone, so as to show the arrangement of the principal internal organs in their natural positions.

A searching study of the parts of the bird's body will give the earnest student a knowledge of its internal structure which will be one of the best features of his proper preparation for poultry feeding and management. Repeating this method of direct personal investigation with birds of different sexes, ages and conditions, with careful comparison of external and internal correlations, will also enable the progressive poultryman to gain an understanding of his subject which

must provide the best possible foundation for wise mating of his breeding stock and for the most successful treatment of his fowls under whatsoever conditions he may carry on the poultry business.

DISSECTION, DESCRIPTION.

The short, strong, somewhat curved beak of hard, horny substance is well suited for seizing bits of food or breaking into small pieces portions too large for swallowing whole. Forcing open the bird's beak gives one some idea of the strength of the muscles which operate the lower mandible. This will also expose to view the mouth and its parts. The arrow-shaped tongue has its pointed part fitting neatly into the cavity of the lower mandible, while its broader portion extends back to the beginning of the throat. By pressing a finger up between the lower jaws from the outside, the tongue may be pushed up showing its underside and the muscle connected with its middle and rear portions. Notice the difference in the surfaces of the upper and under sides of the tongue. The roof of the mouth is formed of tough cartilage which corresponds in size and shape to the tongue but has a slit extending lengthwise along its middle.

When food is taken into the bird's mouth there is a slight flow of saliva through minute openings which connect with thin glands in the sides of the mouth. Grains, bits of grass or other green herbage, pieces of meat and other food taken into the mouth are not there mingled and masticated but are quickly swallowed. The absence of teeth in the bird's mouth precludes the grinding of the food before it goes down the food-tube.

By slitting open the mouth at the sides from the juncture of the mandibles to the rear of the tongue all the parts from the point of the beak to the beginning of the gullet may be very completely exposed for examination.

Next looking down the gullet, just below the base of the tongue, a peculiar opening is seen which is the

entrance to the windpipe, connecting with the lungs. By cutting away the outer skin of the neck, the spinal column, the windpipe and the gullet are laid bare. The breathing tube is ribbed, somewhat gristly and nearly transparent, while the food-tube is of about the same size but smooth, soft, flexible and of grayish color. These two tubes run parallel and close together along the neck-bone to the clavicle or "wish bone" at the forward part of the breast. Here the food-tube enlarges, forming the "crop." If the bird had partaken of a hearty meal a short time before being killed, this part of the digestive system will be found to be distended with food mingled with water and digestive fluids. By opening, emptying and inverting this food receptacle it is seen to have an inner lining of glandular follicles, through which are supplied digestive liquids. These by mingling with the contents of the crop serve to soften and help to make solvent the particles of food.

By cutting the ribs and the intervening tissue on both sides of the bird from front to rear, the lower or breast part may be removed exposing the interior of the fowl to view. The food-tube is seen to extend from the crop towards the rear, between the heart and the liver which are in the front or chest cavity. This cavity also contains the lungs which are pinkish in color and lie close to the backbone. The windpipe as it passes between and beyond the clavicle bones, divides and sends branches to connect with each of the two lungs. The chest cavity is separated from the rear or abdominal cavity by the diaphragm, a thin, almost transparent membrane. Just back of this membrane and near the spinal column are the sexual organs.

The digestive canal as it passes to the rear enlarges somewhat to form what is termed the stomach and then connects with the gizzard. Cutting open the stomach and turning out its inner linings shows the peculiar glandular surfaces which furnish further digestive liquids and aid in the dissolving and assimilating of the food.

Dissecting the dark colored, tough, muscular gizzard shows the thickness of its walls, the roughness of its interior linings and reveals its content of pebbles or grit and finely ground food. The grinding, moistening and mingling of the food fragments in this "grist mill" of the bird more than make up for the lack of teeth and of mastication in the mouth. The mass of food becomes pulpy.

The gizzard opens into the intestinal canal which first forms a long loop enclosing the pancreas, an organ several inches long and of pale flesh color. This organ furnishes the pancreatic juice which mingles with the pulpy mass of nutriment after it passes from the gizzard into the intestines. The small dark almost black colored gall-bladder, close to the liver, delivers the bile which aids in the digestive processes. The dark (bluish) red colored spleen, an organ of small size found in this region has not been sufficiently studied. The kidneys occupy pockets in the back of the fowl.

The intestines, folding many times, have a length of several feet in an adult fowl and occupy most of the space of the abdominal cavity. A few inches from the rear end of the intestinal tube, two branches of this tube extend along its sides and form pockets which are commonly called the "blind guts." The scientific name of one of these branches is *caecum* and both together are termed the *caeca*. In mature fowls these branches of the intestine are from five to seven inches in length. Near the end of the intestinal canal an enlargement occurs which is named the *cloaca*. The tubes from the kidneys and from the sexual organs of the fowl connect with the intestinal canal at the cloaca. The termination of the canal is the vent.

The total length of the digestive canal from beak to vent in an adult fowl is ordinarily from four to five feet. This apparatus digests most effectually all the digestible portions of the food swallowed by the bird. The dissolved portions pass through the walls of the digestive tract into the lymphatic vessels which contribute their contents to the blood. The indigestible

parts, the urinary products, the wastes of the system are voided. The digestive system of healthy fowls operates perfectly under natural conditions of food and feeding.

THE NUTRIENTS.

The food of fowls consists of digestible and indigestible portions. The digestible part furnishes the nutriment for replenishing the blood. The indigestible part serves to extend the food or gives it a bulk which adapts it to treatment in the digestive processes as it passes through the digestive tract. The nourishing parts of the food are termed nutrients. These are made up of fifteen chemical elements combined into various organic compounds.

The nutrients may for convenience be divided into several groups.

1. *Mineral Portion*:—The mineral compounds of the food are frequently termed the "ash constituents" since they remain if the feed-stuff is subjected to complete burning. The phosphates of lime are very important mineral substances of the food. Compounds of sodium, potassium, magnesium, iron and chlorine, are also included and seem to be necessary. Fluorine and silicon are also present. Calcium phosphates play a very important part in the formation of the skeleton of growing fowls and in renewing the bones of mature birds.

Calcium also unites with carbonic acid to form the carbonate of lime of which the shells of eggs are mostly made. Chloride of sodium (common salt) seems to be needed in greater quantity than is furnished to the fowls by ordinary feed-stuffs.

2. *Protein Portion*:—All the parts of the food which contain nitrogen are grouped together as proteids. The protein compounds include besides the all-important nitrogen, the constituents of water (which are oxygen and hydrogen) and also in some cases sulphur, phosphorus and iron. The digestible proteids are of great value because these mainly go to make flesh or

muscle, brains and nerves. These compounds also form the collagen of the tendons, the ossein of the skeleton and parts of the skin, feathers, beak, toenails, etc. The white of the egg (albumen) is almost pure protein.

The proteids may aid in keeping up the body temperature in case of necessity.

These nitrogenous constituents are absolutely necessary to the continued life or growth of the fowl.

3. *Carbohydrate Portion*:—A very large part of some of the favorite foods of fowls consists of starch, sugar and fiber made up chemically of carbon and the elements of water (oxygen and hydrogen). This group receives the name of carbohydrates.

These nutrients, especially the digestible sugars and starches are valuable and economical sources of heat and energy and are also stored in the fowl's body in the form of fat.

4. *Fatty Portion*:—Many foods contain fats or oils which are also composed of carbon, oxygen and hydrogen. These fatty constituents have on the average two and one-fourth times the heating power of the carbohydrates, when oxidized in the fowl's system to maintain body temperature. When more fatty nutrients are digested and assimilated by the fowl than are needed it usually proceeds to store up the surplus in the form of fat. A well-fed, caponized chicken may thus increase in plumpness until one-third of its body weight is composed of fat.

THE FEED-STUFFS.

Fowls are omnivorous, eating nearly all things that are eatable.

Their food should be organic, i. e. of plant or animal origin.

Whatever feed-stuffs are used have their nourishing value determined by the *digestible nutrients* which the fowls extract from them in the process of digestion.

The necessary supplies for the digestive system

may be all included in four groups graphically expressed by the following four words:

GRITS, GRAINS, GREENS, GRUBS.

1. Grits include gravel, small pebbles, coarse sand, broken crockery or other hard substances of the right size for use as mill-stones in the fowl's gizzard. If the grinding materials are supplied in the form of granulated bone, nourishment is also furnished in the form of phosphate of lime which is of use in forming and repairing the bony framework of the fowl. Crushed oyster-shells and clam-shells answer the purpose of grit to some extent and also furnish carbonate of lime for making the shells of the hens' eggs.

2. Grains such as wheat, corn (maize), oats, barley, rice, etc., are largely composed of starch and contain some oily, mineral and nitrogenous nutrients.

The seeds of some varieties of leguminous crops, such as peas and beans supply a larger proportion of nitrogenous nutrients than the regular grain crops. The same is true of the seeds of sunflowers and hemp and these also contain an extra amount of oily compounds.

The seeds of numerous other plants are relished by poultry and supply mainly the carbohydrates, particularly starch and fiber.

3. Green food is amply supplied in the growing season by the fresh blades of young grass or grain. Leafy garden crops like lettuce, kale, rape, swiss chard, beet-leaves, spinach and cabbage furnish excellent "greens" for the fowls.

Chick-weed is a favorite green food for chickens. Cabbages, mangolds, turnips and potatoes are often fed to fowls when the cold weather cuts off the supply of green grass or when the flocks are kept in confinement.

The leaves of clover and alfalfa hay are especially excellent substitutes for fresh green food in the winter time, and furnish considerable quantities of protein nutrients.



A BARRED ROCK PULLET

Courtesy W. F. Scholz

All of the green foods mentioned contain a large amount of fiber. The starchy, fatty and mineral nutrients are also included in varying degrees.

The fresh, rapidly growing green crops contain a very large proportion of water which helps to give them succulence. Besides supplying some nourishment these feed-stuffs help to keep the digestive system in good order and tend especially to prevent constipation of the intestinal canal. They also have a beneficial effect upon the blood and the breeding organs and their products. Apples and other fruits are sometimes fed to poultry.

4. Grubs, grasshoppers, flies and other insects, as well as worms and larvae of various kinds detected by the alert eyes of chickens on range are quickly snapped up and swallowed. By this natural plan of feeding, the birds obtain considerable quantities of protein nutrients to balance the starchy grains and seeds which they eat. Only in exceptional cases and at certain seasons is this supply ever adequate.

To provide protein food in sufficient quantity it usually becomes necessary to feed to the flocks animal food in some form. Meat is a favorite protein food. Use is made of the flesh of horses, cattle, rabbits, etc. Beef scraps and animal meal are by-products of the great packing houses, which are sold in large quantities for feeding to poultry. Fresh bones are cut to suitable sizes for feeding to fowls. Fish is sometimes utilized for the same purpose. Skim milk, buttermilk and milk curds are rich in casein which is a valuable protein nutrient.

As already suggested under grain foods, there are some kinds of beans and peas that fowls will eat as well as clover and alfalfa and these crops supply considerable vegetable protein.

CONDITIONS OF FEEDS AND FEEDING.

There is naturally great variation in the feeding stuffs used and in the methods of feeding for the flocks of fowls kept in different circumstances. No one plan

can be developed which will be copied and applied successfully by all poultry feeders.

It is practicable, however, to work out a separate system of management for each case and this is one of the places where a good brain is of great value in the poultry business. The poultryman should study the feeding problem for his flock with a determination to gain the right solution, which should accord with the facts that have become established through practical experience and scientific experimentation in poultry feeding.

1. The available feed-stuffs may first be considered. These include any and all crops suited to poultry feeding that are grown on the place where the fowls are kept or on the farms in the locality and all the poultry feeds sold on the markets in the vicinity or obtainable from more distant markets. The quantity and quality of the feeds available and the cost of their production or purchase affect the economy of feeding sufficiently to make this a matter worthy of thorough investigation.

2. The feeding materials must be strictly wholesome in order that the nutriment which they furnish shall produce the best results without danger of inducing unhealthy conditions in the fowls.

3. The food should be palatable so that by its appetizing taste it will induce full feeding, up to the capacity of the fowls to use the nourishment for their maintenance and the making of profitable poultry products.

Considerable food is needed to maintain the bird's body, keeping it warm, providing for the digestion and assimilation of the nutrients, pushing the blood through the circulatory system, furnishing energy for muscular action in the movements of the body, etc. It is mainly the extra food eaten and used for the further purposes of growth, fattening and egg-production that brings financial profit. Condimental foods should not be used.

4. The feeding stuffs should be supplied in considerable variety to increase the attractiveness of eating and prevent the birds' appetites becoming cloyed.

The many kinds of food which are relished by land fowl make it possible to easily vary their rations sufficiently to encourage ample eating. Gradual and reasonable changes in their diet also tend sometimes to prevent the overworking of one or more of the organs of digestion.

5. The feed-stuffs are usually best fed in their natural state. Grinding, breaking and cutting are of use when necessary to reduce the materials in size so that they may be readily swallowed.

Cooking the food seems to be undesirable except in a few cases where it improves the flavor of the article of diet or annihilates disease germs that might possibly be conveyed by the food to the fowl.

Even the moistening of the food with water is ordinarily a disadvantage, although it may be allowable in some cases where a saving in expense is secured. Where flocks of hens are being urged to the largest possible production of eggs for market in cold weather they are sometimes fed with warm mashes made up of wheat middlings, bran, corn meal, animal meal or finely ground beef scraps and perhaps some clover meal or alfalfa meal. If these feed-stuffs in finely ground form furnish the necessary nutrients for a part of the day's ration at a saving of cost for food, reduce somewhat the work of the overtaxed digestive system in grinding, and enable the fowls to manufacture a larger quantity of food into a finished market product than they otherwise would, there is some reason in feeding them once a day in moist, crumbly mashes.

For growing chickens that are to become breeders and for fowls that are breeding, the more natural method of feeding grains whole, and other foods in dry, granulated form seems desirable. The poultryman has here opportunity for the exercise of good judgment according to the accompanying conditions and the purpose in feeding.

6. The rations should be balanced so that there will be supplied to the fowls daily, enough mineral constituents, fatty nutrients and carbohydrates and cer-



S. C. BUFF ORPINGTON

Courtesy P. W. Hutton

tainly sufficient protein compounds, all in digestible form, to enable the birds, according to their condition and surroundings, to maintain their bodies in life and health and make whatever products are required. It is true economy to provide the right proportion of each class of nutrients because in this way the actual needs of the bird's body are promptly and fully met, without waste and with directness, as will be more fully explained.

7. The frequency of feeding is largely a matter of habit. Fowls in the wild state usually eat little at a time and as often as food is found. In the search for their daily food the birds take considerable exercise.

Any plan of feeding which secures the advantages of these natural conditions will answer for domesticated fowls.

Inordinate gorging, especially with finely ground feeds or with wet mash and the lack of bodily exercise are to be avoided.

Hopper feeding with dry feed-stuffs, the food being constantly within reach of the fowls, operates all right when the fowls are accustomed to it and have ample range.

Throwing a portion of the grains into straw litter so that the fowls will search and scratch for a part of their daily rations, has proved especially beneficial for fowls confined in houses during cold seasons and inclement weather.

8. Plenty of pure, fresh air for breathing must accompany any successful method of feeding. The carbonaceous nutrients (fats, starches, sugars, etc.) of the food, after they become assimilated are of use in keeping up the body temperature only as they become oxidized, for which purpose the oxygen of the air breathed in by the birds is needed.

9. Prevention of loss of blood or of nutrients of the food by the attacks of external and internal parasites is necessary. Nutriment which goes to feed pestiferous mites and intestinal worms certainly does not become transformed into flesh, feathers or eggs.

10. A suitable strain of fowls should be selected for accomplishing the purpose of the poultry feeder. The birds must be adapted to the local conditions.

The best of rations and the most careful system of feeding are fully effective only when the fowls have the capacity to promptly utilize the food and the powers to transform its digestible nutrients into desirable and valuable products. The flock should, in fact, possess the feeding quality in superior degree. According to the object of the poultryman the fowls should be easy keeping i. e. maintaining themselves on a reasonable proportion of the food consumed, early maturing and readily fattening if to be disposed of as dressed poultry, excellent layers if eggs are the product mostly desired and growing fine feathers if exhibition plumage is the main thing.

SCIENTIFIC FOUNDATION OF FEEDING.

Since the value of a food for furnishing nourishment depends solely upon the nutrients which can be extracted from it by the processes of digestion it is possible to measure and compare the valuations of different feed-stuffs.

This knowledge being acquired it is then practicable to mingle several feed-stuffs in a daily ration so that the quantities and proportions of the total digestible nutrients contained in the complete ration shall fit the needs of the fowls. Such a ration will be well adapted to the purpose of feeding according to the season, the condition of the fowls, their environment and the products they are expected to make.

By chemical analysis the composition of the different kinds of feed-stuffs has been ascertained. Only a percentage of each of the compounds contained in a feed-stuff is digestible, however.

Experiments have been conducted in feeding animals in order to learn what the percentages of digestibility really are. These percentages are termed the co-efficients of digestibility and they state the averages of actual nourishment obtainable, under the conditions

of experimentation, from the nutrients of the feed-stuffs employed by the animals fed.

The results of numerous chemical analyses and of many feeding experiments are given in the following table for the principal feed-stuffs available for poultry.

TABLE A.

PRINCIPAL POULTRY FEED-STUFFS.

Stating the Dry Matter, Ash, Nutrients and Fuel Value in One Pound of Each. Also the Nutritive Ratio.

FEED STUFFS	Dry Matter	Ash	DIGESTIBLE NUTRIENTS			Fuel Value	Nutritive Ratio
			Protein	Carbohydrates	Fat		
GRAINS, MEALS, ETC.	Lb.	Lb.	Lb.	Lb.	Lb.	Cal-ori's	
Wheat	.895	.018	.1023	.6921	.0168	1548	1:7.1
Wheat Middlings...	.840	.038	.1270	.5315	.0340	1370	1:4.8
Wheat Bran.....	.885	.058	.1201	.4123	.0287	1111	1:4
Indian Corn.....	.891	.015	.0714	.6612	.0497	1572	1:10.5
Corn Meal.....	.850	.014	.0626	.6526	.0350	1478	1:11.7
Corn and Cob Meal.	.849	.015	.0476	.6006	.0294	1330	1:14
Gluten Meal.....	.905	.013	.3309	.3996	.0475	1559	1:1.5
Oats	.890	.030	.0925	.4834	.0418	1247	1:6.2
Oat Meal.....	.921	.020	.1153	.5206	.0593	1433	1:5.7
Barley	.891	.024	.0869	.6483	.0160	1435	1:7.9
Rye.....	.884	.019	.0912	.6973	.0136	1524	1:8
*Buckwheat	.874	.020	.1000	.6450	.0220	1575	1:7.4
Buckwheat Mid'l'gs	.882	.048	.2234	.3614	.0621	1350	1:2.3
Buckwheat Bran...	.885	.030	.1929	.3165	.0456	1140	1:2.2
*Sunflower Seed....	.914	.026	.1630	.2140	.2120	1586	1:4.3
*Millet	.865	.030	.1270	.5800	.0330	1454	1:5.1
Kafir Corn.....	.875	.013	.0578	.5358	.0133	1160	1:9.8
*Rice	.877	.003	.0680	.7740	.0030	1625	1:11.5
Pea Meal.....	.895	.026	.1677	.5178	.0065	1302	1:3.2
*Soya Beans.....	.892	.047	.3400	.2880	.1690	1881	1:2
*Cow Peas.....	.881	.034	.2350	.5950	.0170	1615	1:2.7
*Hemp Seed.....	.920	.020	1.000	.4500	.2100	1909	1:5
Linseed Meal (N.P.)	.901	.056	.3059	.3872	.0290	1412	1:1.5
Linseed Meal (O.P.)	.908	.057	.2876	.3281	.0706	1443	1:1.7
Malt Sprouts.....	.898	.064	.1872	.4350	.0116	1206	1:2.5
White Bread.....	.647	.008	.0780	.5200	.0120	1200	1:7

VEGETABLES, ETC.	Lb.	Lb.	Lb.	Lb.	Lb.	Cal-ori's
Green Grass.....	.347	.023	.0206	.2124	.0058	458 1:11
Green Clover.....	.292	.021	.0307	.1482	.0069	362 1:5.3
Green Alfalfa.....	.282	.027	.0389	.1120	.0041	298 1:3.1
Mixed Hay.....	.871	.055	.0422	.4326	.0133	939 1:11
Clover Hay.....	.847	.062	.0738	.3815	.0131	923 1:5.7
Alfalfa Hay.....	.916	.074	.1058	.3733	.0138	949 1:3.9
Mangolds	.091	.010	.0103	.0565	.0011	129 1:5.7
Turnips	.095	.008	.0081	.0646	.0011	140 1:8.3
Carrots	.114	.010	.0081	.0783	.0022	170 1:10.3
Potatoes	.211	.010	.0136	.1643		331 1:12
*Cabbages	.095	.014	.0240	.0390	.0040	133 1:2
*Lettuce	.041	.008	.0100	.0160	.0020	57 1:2.1
*Onions	.124	.006	.0140	.0940	.0030	213 1:7.2
*Apples	.159	.002	.0020	.1430	.0030	282 1:74.9
ANIMAL FEEDS	Lb.	Lb.	Lb.	Lb.	Lb.	Cal-ori's
Beef Scraps.....	.987	.153	.4850		.1520	1544 1:0.7
Animal Meal.....	.903	.041	.2880		.0495	744 1:0.4
*Dried Blood.....	.933	.066	.6510	.0530	.1630	1997 1:0.65
*Fresh-Cut Bone...	.931	.245	.2230		.1650	1111 1:1.7
Dried Fish.....	.892	.292	.4840		.1160	1390 1:0.54
*Horse Flesh.....	.257	.014	.2170		.0260	516 1:0.27
Eggs (less shells)..	.345	.009	.1270		.0880	608 1:1.6
Skim-milk	.096	.007	.0310	.0461	.0090	181 1:2.1
Separator Milk....	.094	.007	.0301	.0510	.0030	164 1:1.9
Buttermilk	.090	.007	.0282	.0470	.0050	161 1:2.1
Whey	.062	.004	.0056	.0500	.0010	108 1:9.3

*The digestibility of these feed-stuffs has not been determined. The figures for them are based on chemical analyses.

The figures of Table A are averages. There is some variation in the composition and digestibility of a given kind of feed-stuff. For example one crop of oats may vary considerably from another in the content of starch, fiber, etc., and hence in feeding value.

In scientific feeding experiments, samples of the actual feed-stuffs used are chemically analyzed to insure accuracy in the calculation of results.

The tabulations according to averages are, however, sufficiently accurate for use in calculating trial rations in practical poultry feeding.

In studying the data given in Table A it will be

seen that there are two ways of expressing the value of a feed-stuff. First, the quantity of heating power contained in a given weight of the feed-stuff may be determined. This is termed its "fuel value" and is expressed in Calories or "heat units." A Calorie signifies the quantity of heat required to raise the temperature of one pound of water four degrees Fahrenheit. Expressed in terms of work this is equivalent to the power necessary to lift one ton vertically 1.53 feet. The fuel value of the nutrients is calculated according to the following method:

One pound of digestible fat in a food is considered to have a heating power of 4220 Calories. One pound of either digestible carbohydrates or proteids is considered to have a heating value equivalent to 1860 Calories.

To calculate the heating value of one pound of Indian Corn (Maize) for example, proceed as follows: Reference to Table A shows that in one pound of corn there are .0714 of a pound of digestible protein and .6612 of a pound of digestible carbohydrates. Adding these two amounts gives .7326 of a pound of nutrients and multiplying this sum by 1860 gives 1362.6 Calories. The digestible fat in one pound of corn is found to be .0497 of one pound, which multiplied by 4220 gives a result of 209.7 Calories. Adding 1362.6 to 209.7 gives a total of 1572 Calories, which expresses the fuel value or quantity of heating power contained on the average in one pound of corn.

Secondly, the quality of a feed-stuff may be measured and expressed by the proportion of its nitrogenous to its non-nitrogenous digestible nutrients, which is termed its "nutritive ratio."

As the fats have two and one-fourth times the heating power of the carbohydrates (starches, sugars, fibres), the weight of the fatty nutrients is multiplied by two and one-fourth to bring all the non-nitrogenous nutrients to one level of value in calculating the ratio. Take again for example the case of Indian Corn. Referring to Table A, one pound of Corn is found to have

.0497 of a pound of digestible fat which multiplied by 2 1-4 gives .1118 of a pound. Adding this amount to the content of digestible carbohydrates .6612 of a pound gives a total of .7730 of a pound expressed in terms of digestible carbohydrates. The digestible protein in one pound of Corn is found in Table A to be .0714 of a pound. Dividing the total of non-nitrogenous digestible nutrients .7730 by the digestible protein .0714 gives a result of 10.8 and the proportion may be expressed as follows:

Protein	Carbohydrates		Protein	Carbohydrates
.0714	:	.7730	equals	1. : 10.8

Indian Corn is thus shown to have a nutritive ratio of 1:10.8 i. e. one part of digestible protein to ten and eight-tenths parts of digestible carbohydrates and fats expressed in terms of carbohydrates. In other words Corn is a starchy food and excellent to feed for keeping up body temperature and for fattening. A feed-stuff having a nutritive ratio above 1:8 is considered to have a wide ratio. A ratio of 1:5.5 or under is narrow. One between these extremes (e. g. 1:6) is said to be a medium ratio.

It is evident that a poultry food having a narrow nutritive ratio is comparatively rich in protein and therefore useful to feed for growth and for egg-production. A food having a wide nutritive ratio is adapted for use in a fattening ration because of its large content of starch or fat or both.

FEEDING STANDARDS.

In arranging the rations for feeding his flocks the poultryman should seek to learn definitely what heating power, nutritive ratio and total weight of digestive nutrients will enable his fowls to do their best according to the purpose he has in view and considering all the surrounding conditions.

In feeding horses and cattle it is not difficult to fit the ration to the needs of each individual animal but in feeding poultry this is impracticable. Fowls are fed

in flocks and it is therefore desirable that the birds of each group should be of one breed or variety, of approximately the same age and alike in body condition. The ration is then figured to fit the average of the flock.



WHITE WYANDOTTE

Courtesy Chas. V. Keeler

The idea is to supply a scientific foundation for starting in feeding and avoid the necessity of working out the problem through costly experience.

Having reckoned a trial ration according to a standard, the ration is tested in practice. The fowls show the effects of the feeding and the feeder interprets

the results. He makes this matter a constant study until he has the ration adjusted to suit the case. If changes in the ration seem to be called for he makes them gradually according to his best judgment and finally develops a feeding system that is scientific, sensible and successful. The New York State Agricultural Experiment Station has, by careful experimentation with poultry, determined several standards for feeding rations which should prove very helpful as guides in reckoning rations for certain conditions and purposes.

These standards state the average quantities of dry matter, mineral constituents, digestible protein, carbohydrate and fat nutrients, the fuel value and the nutritive ratio of the daily rations which, in the experiments, produced the best results.

First it will be of interest to note what amounts of the different nutrients are necessary to simply maintain mature fowls in healthy condition, without gain or loss of body-weight and without producing eggs or new feathers.

STANDARDS FOR MAINTENANCE RATIONS.

Digestible Nutrients Per Day, Per Each 100 Lbs.
Live Weight of Fowls.

Live Weight	Dry Matter Lbs.	Ash—Lbs.	Protein Lbs.	Carbohy- drates—Lbs.	Fat—Lbs.	Fuel Value Calories	Nutritive Ratio
Hens 3-5 lbs.	3.90	.15	.50	2.95	.30	7680	1:7.4
Hens 5-7 lbs.	2.70	.10	.40	2.00	.20	5300	1:6.2

The experiment station found the following daily ration sufficiently close to the standard requirements for hens of five to seven pounds live weight: Cracked corn (maize) 1 lb., corn meal 1 lb., ground oats 1-2 lb., wheat middlings 1-2 lb., clover hay 1-2 lb., fresh bone 1-4 lb., meat scraps 1-8 lb.

The poultryman is not usually satisfied to have his hens simply maintain themselves without gain or pro-

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duction, but the maintenance standard shows emphatically that a large amount of the rations consumed by fowls is used to keep them in life and health.

When in addition to maintenance, it is desired to secure from the fowls a large production of eggs the rations must be larger and also richer in protein nutrients.

STANDARDS FOR LAYING RATIONS.

Digestive Nutrients Per Day, Per Each 100 lbs. Live Weight of Fowls.

Live Weight	Dry Matter Lbs.	Ash—Lbs.	Protein Lbs.	Carbohy- drates—Lbs.	Fat—Lbs.	Fuel Value Calories	Nutritive Ratio
Hens 3-5 lbs..	5.50	.30	1.00	3.75	.35	10,300	1:4.6
Hens 5-8 lbs..	3.30	.20	.65	2.25	.20	6,240	1:4.2

A combination of feed-stuffs which meets the requirements of the standard for hens of 3-5 lbs. live weight is the following: Corn (maize) 3 lbs., wheat 2 lbs., beef scraps 1 lb., clover hay 1 lb. This is especially well adapted for dry feeding in the winter time.

The experiment station suggests the following daily ration for hens of 5-8 lbs. live weight: Cracked corn 1 lb., wheat 3-4 lb., corn meal 3-4 lb., wheat middlings 1-2 lb., buckwheat middlings 1-2 lb., animal meal 1-2 lb., fresh bone 2-3 lb., young green alfalfa 3-4 lb. This daily ration is adapted to summer feeding and the ground feed-stuffs may, if desired, be fed as moist mash-
es or, if preferred, these may be fed dry in hoppers.

Growing chickens require rations having narrow nutritive ratios, even narrower than those for laying hens. Protein nutrients must be supplied to them abundantly for use in making muscles, the ossein of bones, the collagen of tendons and the nitrogenous parts of brains, nerves, feathers, etc., etc.

These standards are for feeding chickens from hatch-
ing time up to three months of age.

STANDARDS FOR GROWING RATIONS.

Digestive Nutrients Per Day, Per Each
100 Lbs. Live Weight.

CHICKS Age Period	Dry Matter Lbs.	Ash—Lbs.	Protein Lbs.	Carbohy- drates—Lbs.	Fat—Lbs.	Fuel Value Calories	Nutritive Ratio
First two weeks.....	10.1	.6	2.0	7.2	.4	18,800	1:4.1
Two to four weeks...	9.6	.7	2.2	6.2	.5	17,730	1:3.4
Four to six weeks...	8.6	.6	2.0	5.6	.4	15,640	1:3.3
Six to eight weeks...	7.4	.5	1.6	4.9	.4	13,780	1:3.7
Eight to ten weeks...	6.4	.5	1.2	4.4	.3	11,680	1:4.3
Ten to twelve weeks	5.4	.4	1.0	3.7	.3	10,000	1:4.4

A sample daily ration, suggested by the station, for feeding chicks during the second week includes the following feed-stuffs: Cracked wheat 4 lbs., granulated oat meal 2 lbs., wheat middlings 1-2 lb., buckwheat mid-
dlings 1-2 lb., ground oats 1-2 lb., linseed meal (old process) 1-2 lb., animal meal 2 1-4 lbs., young green alfalfa 2 3-4 lbs.

While this combination meets with the standard requirements as to digestible nutrients it may contain too much finely ground materials to suit some chick feeders. These portions, however, need not necessarily be made into a moist mash for feeding. Chicks can be taught to eat meals in dry form out of hoppers. The quantity of food given in this sample daily ration will answer for about one thousand chicks.

As already stated in Chapter IV, a balanced ration for feeding growing chicks may be made up of feed-stuffs in granular dry form. The mixture of cracked corn 3 lbs., wheat 3 lbs., beef scraps 2 lbs., and cut clover 2 lbs., answers fairly well the requirements of the standard for chicks about seven weeks old.

BALANCING RATIONS.

To illustrate the method of reckoning and correct-

ing rations take the case of the sample ration suggested for laying hens of 3 to 5 lbs. live weight.

Consulting Table A for the necessary data and taking, to start with, 3 lbs. of corn and 2 lbs. of wheat the constituents are written in tabular form. By adding the columns of nutrients and comparing with the standard it is seen that the totals are not sufficient and that the fuel value is too small. Computation shows that the nutritive ratio (1:9) is altogether too wide.

Bringing to the ration 1 lb. of beef scraps, adding and computing again, shows on comparison with the standard that, although much nearer right than before, it is still lacking.

One pound of cut clover hay added to the three previous items gives a ration that is quite close to the demands of the standard. Adding a pound of skim-milk makes this laying ration almost exactly correspond to the standard.

The successive steps in reckoning this ration are given together as follows:

RECKONING A LAYING RATION.

Daily Feeding for 100 lbs. Live Weight of 3-5 lb. Hens.

Feed	Weight Lbs.	Dry Matter Lbs.	Ash—Lbs.	Protein Lbs.	Carbohy- drates—Lbs.	Fat—Lbs.	Fuel Value, Calories	Nutritive Ratio
Corn	3	2.673	.045	.2142	1.9836	.1491	4,716	1:10.6
Wheat ...	2	1.790	.036	.2046	1.3842	.0336	3,096	1:7.1
Sum....	5	4.463	.081	.4188	3.3678	.1827	7,812	1:9
Beef Scraps	1	.987	.153	.4850		.1520	1,544	1:0.7
Sum....	6	5.450	.234	.9038	3.3678	.3347	9,356	1:4.66
Clover Hay	1	.847	.062	.0738	.3815	.0181	923	1:5.7
Sum....	7	6.297	.296	.9776	3.7493	.3528	10,279	1:4.65
Sep. Milk.	1	.094	.007	.0301	.0510	.0030	164	1:2
Total ...	8	6.391	.303	1.0077	3.8003	.3558	10,443	1:4.57
Standard .		5.50	.30	1.00	3.75	.35	10,300	1:4.6

The one pound of skim-milk would not ordinarily be used in this laying ration, unless the poultryman hap-

pened to have this small quantity available and wished to dispose of it in this way. If he had a large amount of skim-milk as a by-product, available or cheaply obtainable, he would then reckon his laying ration to use more of this protein food and purchase less of the costly beef scraps.

A MOLTING RATION.

The standard for laying hens answers nicely for molting time when new feathers are to be made for renewing the plumage. It has been learned by experience, however, that certain kinds of feed-stuffs are especially adapted for feeding as a part of the diet during the molting season.

Two slight changes in the laying ration previously suggested, will make it practically perfect for feeding to molting fowls. One-half pound of linseed meal (preferably old process "oil meal") is substituted for one-half pound of the beef scraps. The ration will then consist of 3 lbs. corn, 2 lbs. wheat, 1-2 lb. beef scraps, 1-2 lb. linseed meal and green grass, clover or alfalfa all the fowls care for in place of the 1 lb. of clover hay. Some poultrymen prefer to feed sunflower seeds or hemp seeds rather than linseed meal in the rations during the molting period.



FEEDING TIME

CHAPTER VII

Parasites and Diseases

Parasites both external and internal, are detrimental to poultry and poultry profits in two ways. They are the direct cause of annoyance, suffering and loss, and by their silent, secret work they prepare the way for debility and disease, which too often results in the death of the fowls and the destruction of the poultryman's hopes.

EXTERNAL PARASITES.

Few poultry keepers realize the extent to which external parasites prevail upon fowls and in their shelters.

There are many kinds of these minute pests of poultry. Some of these insects cause itching of the skin, the irritation tending to uneasiness and discomfort of the fowls. Others injure the feathers, either in the quill or the web and some of these may cause the plumage to fall off. Others burrow under the scales of the shanks and toes, others gnaw the skin and tissues and yet others suck the blood of the birds through the skin.

All of these are enemies to successful poultry-keeping.

Whenever fowls appear to be out of condition or sick in any way the first thing to ascertain is whether their bodies are afflicted with parasites of any kind or not.

Precautions should be taken to prevent the presence, in the poultry quarters, of any and all of these pestiferous creatures.

Cleanliness of the fowls and of their surroundings is a wonderful hindrance to their presence. The poultry house should be thoroughly cleaned out at least once, or better, two or more times annually.

Spraying the interior and furnishings of the hen house with a two per cent. solution of carbolic acid

(ninety-eight parts water, two parts concentrated carbolic acid) will tend to keep the pests at a distance. An emulsion for spraying may be made as follows:

One pound of hard soap is cut into thin shavings and dissolved in one gallon of water. Heat gradually until it boils, then add one pint of crude carbolic acid. Force this through a force-pump, directing the nozzle of the outlet pipe so that the stream strikes back into the receptacle, thus churning the warm liquid until it becomes a creamy mass. On cooling the mixture becomes jelly-like. This is kept as a stock emulsion. For use take one pint of the stock, add fourteen pints of water, mix well and apply thoroughly with a spraying pump or a brush.

Some poultrymen use crude petroleum, others ordinary kerosene for applying to the poultry perches. In either case the addition of one or two per cent. of strong carbolic acid makes the liquid more effective.

A kerosene emulsion may be used which is made as follows: One-half pound of hard soap cut into thin shavings is dissolved in six quarts of water, brought to boiling and removed from the stove. While the liquid is yet hot add eight quarts of kerosene. Churn the mixture with a spray-pump until it changes to a soft butter-like mass. Use one part of this stock liquid to nine parts of water for applying with pump or brush.

To render the kerosene emulsion still more offensive to the vermin add one part of concentrated carbolic acid to ninety-nine parts of the liquid before spraying. This is both economical and effective.

Creolin in two per cent. solution is excellent for use in spraying.

Many of the prepared liquid lice killers on the market are excellent and may be bought in any quantity desired.

LICE.

Body lice of several kinds are very prevalent on the skin of fowls where the parts are covered by fluffy feath-

ers. These irritating inhabitants cause some discomfort but do not appear to destroy the live tissues. They are said to subsist on the wastes of the skin and feathers.

If a chicken becomes sickly and shows a dry, scurvy skin, lice are usually found swarming upon its body. They seem to increase and thrive upon birds that are stunted in growth, rough feathered, unthrifty, listless or drooping.

Diarrhea frequently accompanies lousiness. Mature fowls, if numerous inhabited by these parasites are liable to stop laying, become pale of comb and wattles lose condition, show looseness of bowels and general debility.

Lice do their breathing through pores or openings in the sides of their bodies. They may be destroyed by filling these breathing pores with fine powder, oil or suffocating gases.

Dusting:—Whether fowls wallow in dust to kill the body lice, to cleanse their feathers, for bodily comfort or pleasure, or for all of these purposes, the operation certainly tends to discourage the presence of body lice.

A dusting place should be provided for each flock in a comfortable, sheltered spot, where the sunshine will make it doubly attractive. The dust need not be excessively dry, but should be in such condition that it will readily sift through the feathers to the skin when the fowls wallow and roll in it.

Fine mellow garden soil makes a good dust bath. To it may be added finely sifted wood ashes, dry, thoroughly slaked lime, tobacco dust and flowers of sulphur. Any fine dust will answer the purpose and it may be made pungent and repulsive to lice by sprinkling occasionally with a two per cent. solution of carbolic acid.

Male fowls frequently fail to dust themselves sufficiently to keep the lice away. These and any other lousy rows may be dusted by hand. Holding the bird by the legs with head down in an empty barrel or box, the dry lice powder is distributed by hand or sifted from a dredging box among the feathers and worked through them to

the skin. Use a plenty of the dry dust, especially among the fluffy feathers. Apply thoroughly, especially about and below the tail, between the legs, under the wings and around the neck.

Tobacco dust is excellent to use on grown fowls.

For little chicks the best dust is fresh Pyrethrum powder (sold at apothecary shops also as Persian Insect Powder).

An apparatus for dusting several fowls at one time is sold on the market. It is named the "Lightning Lice Killer" and consists of a hollow, horizontal, cloth-covered cylinder which is revolved by a handle. The lousy fowls and the dust are placed in the cylinder, which is then given a few turns, causing the birds' feathers to become well filled with the lice powder. The cylinder is then quickly opened and the fowls set free. The only objection to this method is the discomfort to the fowls resulting from the pungent powder getting into their eyes, nostrils, and throats. A mild powder such as Pyrethrum will, however, not cause serious distress to the fowls.

Dipping:—Fowls may be entirely freed from insects by dipping.

The operation should be done on a warm day or in a warm room and the fowls should be allowed to dry off in very comfortable quarters.

Any good, effective sheep dip or liquid lice killer will answer the purpose. Creolin is suitable, using five ounces to eight quarts of water. The bath is warmed to 105 or 110 degrees Fahrenheit.

The bird, held by the wings and the head, is immersed all except the head, in a bucket containing a sufficient quantity of the diluted dip to cover the body. For one minute the fowl is moved up and down and swayed in the liquid, then lifted and stood upon a board that drains into the bucket. The top of the fowl's head is wet with the dip, avoiding the eyes. The excess of the dip is pressed out of the plumage by a cloth or sponge. The

bird is then placed in a coop in the sunshine or near artificial heat to dry off.

This method is thorough even if somewhat troublesome.

Very good results usually follow the moderate application of the liquid on the skin under the fluffy feathers by means of an oil dropper. Machine oil used in this way spreads freely over the skin and is very effective.

Fumigating:—The fumes of bisulphid of carbon or from liquid lice killer containing this fluid are deadly to insects, but rather difficult and somewhat dangerous to effectively apply.

Carbon bisulphid can be bought in liquid form. If left open to the air it quickly volatilizes, forming an odorous, inflammable gas. It should not be kept or used near a lighted lamp, or fire in any form.

It is possible to treat several fowls at a time in a large box. The liquid is applied to the inner sides of the box, the fowls are placed therein and the top is partly closed, but kept open sufficiently to prevent suffocating the fowls. Ten minutes of this treatment should annihilate the parasites on the fowls that are not too close feathered.

Simply painting the perches of the hen house, just before roosting time, with liquid lice killer or with petroleum, to which has been added five per cent. of carbon bisulphid, helps to banish the parasites.

MITES.

When not full of blood, which they have robbed from the hen, the insects commonly called mites appear yellowish, whitish or almost transparent. It is oftentimes difficult to detect the minute, colorless creatures which hide by day in cracks and crannies of the perches or at the sides of the roosting place. These parasites are only about one-fortieth of an inch in length. They often cluster in colonies and where they congregate for a considerable length of time mealy dust and webs may usually be found.

They pasture on the bodies of the fowls at night or when the birds are on the nests laying or sitting. When they have sucked supplies of blood through the skin of



WHITE PLYMOUTH ROCK

Courtesy H. E. Mattocks

the fowl they become red in color and are often called "red spiders." After getting their fill of good bird's blood these parasites retreat to their hiding places.

In sultry summer weather, if not hindered, they pro-

pagate and swarm by millions. When a hen house becomes thus infested the mites may remain upon the fowls even in the day time, especially if the birds are inactive or stay upon the perches. Mites will sometimes so afflict sitting hens as to drive them from their nests, or if the hens stick to their nests they may die from exhaustion due to loss of blood.

Where the mites become so numerous that they swarm upon the ceiling or under side of the house roof it is easy for them to drop upon the luckless hen or person who enters the infested place.

These parasites do not breathe through pores in their sides like lice but the precautions suggested for preventing lousiness will tend to discourage the presence of mites.

If they are found on the fowls, dipping in liquid lice killer may be necessary. Then keep the fowls away from the infested quarters until the mites are destroyed therein.

All the furnishings of a hen house should be readily removable. The nest-boxes may be freed from lice vermin by soaking them in a barrel or tub or tank filled with sheep dip, or two per cent. carbolic acid solution. The perches may be painted with the liquid. Any other furniture should be sprayed or washed thoroughly with the liquid.

If any mites find hiding places where the carbolic acid spray cannot reach them, they and their crannies should be sealed up by painting with hot tar.

If the house can be closed tightly it may be fumigated by burning brimstone, or with hydrocyanic acid gas. The simplest plan is to use flowers of sulfur and fumigate for several hours.

The fine powdered sulfur is placed in a metallic basin on top of a coal hod or old pail. Alcohol is added to the sulfur so that it can be easily lighted. Having tightly closed the house the sulfur is set on fire and allowed to burn continuously for hours. One pound of sulfur will be sufficient for a hen house that is ten feet by

twelve feet at the sills. Care should be taken to avoid all danger of fire consuming the house.

The brimstone fumes appear to be especially effective following the spraying of the interior walls of the house.

Nest bugs, or bed bugs sometimes invade the hen house and afflict the fowls.

For these pests, as well as for the mites, or any other insect enemies, fumigation by hydrocyanic acid gas is very effective, but more expensive than brimstone. The gas is fatal to human life if taken into the lungs, hence careful management is necessary.

The chemicals used consist of the following, for each hundred cubic feet of interior space: 1 oz. Potassium Cyanide (99 per cent), 1 1-2 ozs. Commercial Sulfuric Acid (1.83 specific gravity) and 2 1-4 ozs. water. The water is placed in a porcelain-lined basin or crockery-ware bowl and the acid is added drop by drop, gradually mixing it with the water to avoid danger of spattering the skin or clothing of the operator. If the acid is added all at once violent boiling and spattering is liable to occur.

The Potassium Cyanide is broken into small fragments, placed in a loose paper bag and suspended over the bowl of acid and water by a string which leads to the outside of the room or house.

The windows and doors are closely shut and all apertures, large or small, stopped up. When ready the bag of Cyanide is dropped into the bowl of liquid by releasing the attached string from the outside.

Let the fumes do their work for fully an hour. Open the doors and windows and air out well before entering the place.

Fleas, ticks, gnats and mosquitoes may bring discomfort to fowls, especially in tropical climates or very hot weather.

Spraying the house and furnishings freely and fre-

quently with two per cent. carbolic acid solution tends to keep away all injurious insects.

Ticks and jigger fleas that attach themselves to the comb and wattles or skin of fowl may be smeared with carbolated vaseline to loosen their grip and close their careers. The kerosene or carbolic emulsion already described will answer the same purpose.

DEPLUMING MITES.

A minute insect sometimes lives on the fowl at the bases of the quills of the feathers and by its operations weakens the plumage. If these mites are numerous their attacks may eventually cause the feathers to break off or fall away.

The neck and head of the fowl may thus become bare. The exposed skin is soft and smooth and may have a pinkish tint. Feathers bordering on the bare spots come out easily and at the bases of their quills the depluming mites may be detected by the aid of a magnifying lense of low power.

Treatment consists in simply rubbing carbolated vaseline into the skin, daily, where the insects are working.

SCABBY LEGS.

The form of scabies which affects the legs and toes of fowls is due to the burrowing of a kind of mite under the scales. The shanks assume an uneven appearance and become crusted with a mealy substance. The mites which cause this disorder may pass from one fowl to another and thus carry the trouble through a flock.

To destroy the insects stand the fowl in a pail of warm, soapy water long enough to soften the scales. Remove any scales that become loosened and burn the same with any adhering crusts or dust. Clean the legs and toes, then rub gently but thoroughly with carbolated vaseline. Treat daily with the ointment until cured.

INTERNAL PARASITES.**GAPE-WORMS**

When little chickens stand about and frequently gasp for breath there is usually some trouble in the wind-pipe or lungs.

Gaping is occasionally a sign of bronchitis, but far more frequently it is due to the presence of reddish worms, which lodge in the wind-pipe. These parasites attach themselves to the inner lining of the trachea, suck blood from the tissues and cause inflammation of the mucous membrane.

In the case of the gape-worm both sexes are connected so that they appear as one worm. The mature female is about one-half inch long, the male one-fifth inch in length. The male is attached to the female at about the distance of his own length from one end of the female so that the combination presents a forked appearance.

When a number of these worms get into the wind-pipe and become filled with blood the breathing is difficult and gaping is a natural result.

Weak chicks often succumb to the attacks of these parasites. Strong chicks may overcome the disorder.

This trouble is particularly prevalent in spring time in warm climates. The chicks appear to get the worms or the eggs that produce them from the ground after the season of frozen ground and frosts is passed.

Gape-worms have been reported to have been found in earth-worms.

If these parasites are present on the premises the land should be deeply plowed or the chickens raised on new ground not infested with gape-worms.

Actual cases of chicks afflicted with gape-worms may, if the birds are strong, be treated with lime dust. The chicks are placed in a box, over which burlap or cheese cloth is fastened. Fine, dry, air-slaked lime is sprinkled upon the cloth and the chicks breathe the dust. The gape-worms loosen their hold in the wind-pipe and the hope of relief then depends upon the success of the

chick in coughing them up and out. Destroy by burning all worms thus expelled and any chicks that die with gape-worms in them.

Extracting the worms by a horse hair loop is practiced.

The premises may be freed from these parasites if the poultryman will burn every chicken that shows symptoms of the disorder. Indications other than the frequent gaping are contracted neck, closing eye-lids, shaking of the head, drooping wings and staggering gait.

ROUND WORMS.

Cylindrical, smooth worms, tapering to each end, pointed in front and blunt in rear, often inhabit the intestines of poultry. Mature worms may measure five inches in length.

These worms take nourishment that should be used for the replenishing of the blood of the fowl and when present in large numbers they interfere with the digestive processes. They may cause diarrhea or stoppage.

To drive them out give the fowl three teaspoonfuls of oil of turpentine or two grains of santonine, one hour before breakfast. Follow three hours later with a dose of twenty grains of Epsom salts in a tablespoonful of water, or use castor oil one teaspoonful in place of the salts.

TAPE-WORMS.

Tape-worms also inhabit the intestines of fowls. They are of several varieties, differing in size, but formed of short, flat sections, which may break apart at the joints. When these parts are discovered in the droppings, or when a fowl loses appetite, becomes thin of flesh, weakened, and the feathers lose their lustre, it is well to give a dose of male fern, one dram of the powdered form or thirty drops of the liquid extract before feeding at morning and at evening. Or give Areca nut, four to five grains (about three-fourths of a teaspoonful of

the powdered nut). Follow in three hours with twenty grains of Epsom salts or a teaspoonful of Castor oil.

If a flock is suspected to be troubled with tapeworms, it may have for breakfast a mash in which is mixed one teaspoonful of powdered pomegranate root bark for each fifty fowls.

To prevent or expel intestinal worms it is an excellent plan to feed occasionally onions or garlic. If the fowls will not eat these readily, they may be chopped fine, tops and all, and mixed in a mash for feeding in the morning when the fowls are hungry.

PARASITES IN THE OVIDUCT.

Two parasites, the common round worm already described and a small fluke, have been reported found in the white of eggs.

It is supposed that these organisms entered the oviduct from the cloaca and were enclosed in the albumen of the egg while the latter was forming in the oviduct.

DISEASES.

Whatever may prepare the way for sickness among fowls, the actual active cause of developing disease is a germ in each case.

Before the "seeds of sickness" will sprout, the "soil" must be in a condition favorable to development and growth of the "seeds." The most favorable and inviting conditions for the development of disease are uncleanness and the presence of parasites.

Diseases are not prevalent among wild fowl.

Probably all of the diseases of poultry are the result of man's mistakes in the domestication and care of the fowls. The birds kept in confined quarters, with no escape from unnatural and unhealthy conditions, succumb to the attacks of disease.

Carelessness, neglect and ignorance prepare the seed-bed and the germs of disease conveyed by air, dust, water, food, clothing, etc., find the conditions right for their development and sickness results.

The germs of disease are microscopic organisms which multiply in multitudes when fostered by decomposing organic matter, rotting mature, stagnant water pools, foul confined air and dark, damp, confined places.

Sanitation does away with all these unhealthy conditions, but even then there is danger if the poultryman purchases fowls supposed to be all right, but actually weak or diseased because bred or raised under evil conditions.

PREVENTION OF DISEASE.

The reasonable, sensible, profitable plan relative to poultry diseases is to prevent them.

First start with healthy stock. It is the part of wisdom to know the poultryman who furnishes the foundation stock, to know the history and record of the flock from which the fowls are taken, and to inspect the quarters in which the birds have been bred and raised.

If this is not possible, the purchaser may at least buy his birds of a reliable breeder and on a guaranty of healthfulness, with the privilege of returning the stock immediately, transportation charges paid, if on arrival the fowls appear unhealthy or unsatisfactory.

If accepted, the birds should next be kept in quarantine for two weeks. A clean hen house will be suitable for this purpose and while the birds are thus confined they should be examined to see if they are free from lice.

The permanent quarters should be fully prepared before the fowls are placed in them. If the house is a new one it should be thoroughly dried out. If an old one, previously used for poultry, it should have been cleaned out, freed from parasites, disinfected to destroy disease germs, and long opened to the air and sunshine. The quarters must be supplied with ample means of ventilation without danger to the fowls from direct drafts of air.

The water fountains and other furnishings should be clean and kept clean.

The floor, if of soil, should be renewed to freshen it.

The yards should be plowed or harrowed. There is wonderful power in freshly turned soil to absorb and banish foulness, parasites and disease germs. The ground of the house and runs should have good natural drainage.

Any garbage, vegetable refuse, dead animals or filth on the place should be promptly buried deep in the soil.

The feeding of the fowls should be sanitary and sensible, according to the directions and suggestions of the previous chapter. Unbalanced rations tend to overwork certain of the organs of digestion and render them liable to take disease.

Constant watchfulness of the flock will enable the poultry keeper to detect any symptoms of indisposition among his fowls. Birds which show even slight signs of sickness should be promptly removed from the flock and kept apart until they fully recover condition.

TREATMENT OF DISEASES.

If a fowl actually becomes sick there is usually little to be gained by "doctoring" the creature. It is a safe rule never to breed from a bird that has been sick and there is rarely any profit gained from a fowl that has suffered serious sickness. Some poultrymen, instead of heroically beheading and burying a sick fowl, prefer to try medical treatment.

In seeking to cure poultry disease, the first step is to diagnose the case, then ascertain the cause, next remove or counteract the conditions leading to the disease and finally attempt to remedy the damage done by the disease.

CLINICAL EQUIPMENT.

The poultry physician will not require a large assortment of instruments but should have at hand a few simple means for his purpose.

A pocket knife with a sharp, thin blade is a prime requisite.

A silver plated teaspoon and a tablespoon are necessary.

A pair of small forceps will come handy.

A medicine dropper with rubber bulb is useful in measuring and giving liquids.

A glass tube, the size of a lead pencil, is useful in blowing powder into the throat.

An atomizer will be needed for light spraying.

A small hand syringe will aid in giving injections.

A catheter, or rubber tube about one-half inch in diameter, and a foot in length will be helpful in carrying doses to the crop.

A small glass funnel to fit into one end of the catheter completes this appliance.

A spraying pump is necessary in applying liquid disinfectants.

A medicine case containing a supply of the principal drugs used for fowls will be convenient.

DIAGNOSIS AND DIRECTIONS FOR TREATMENT.

An alphabetical list of the more or less prevalent diseases of poultry together with brief directions for treatment follows:

Abdominal Dropsy—Abdomen distended with liquid, hangs down, is soft and fluctuating. The fowl becomes listless, feeble, loses appetite, comb and wattles lose color. Probably fed too much corn or excess of starchy foods. Practically incurable. Should have been killed and dressed before reaching this stage. Some relief may follow daily doses of one grain of iodide of potassium or iodide of iron.

Anemia—Wasting and weakness, poor blood or poverty of blood due to lack of proper nutriment in the rations or to incomplete oxidizing of the blood. Pale comb and wattles. Give wholesome, appetizing, balanced rations. Keep fowl free from parasites. House such birds in a clean, comfortable, well ventilated, sun-lighted pen and induce exercise by scattering small grain in straw litter. A tonic may be given. Mix ten drops of tincture

of ferric chloride with one teaspoonful of glycerine and add to one pint of water. This is sufficient for twenty fowls.

Apoplexy—Bursting of blood vessel in the brain, prostrates the fowl, which is found insensible or dead, lying on its side. Comb and wattles purple. Occurs especially in overfat fowls when running or laying. Gorging with food or becoming overheated in sultry weather may bring on an attack. Avoid excess in feeding, especially of fatty and starchy foods.

Asthenia—Often termed "going light," wasting of muscles due to lack of food, unbalanced rations, digestive disorders, external or internal parasites, tuberculosis, blood poisoning. Correct the conditions if possible. Give twice daily, nitrate of bismuth, three grains, powdered cinnamon or cloves, one grain; powdered willow charcoal, three grains, mixed in the mash feed or made into pills with water and flour.

To disinfect the intestines naphthol, bethol or salicylate of bismuth may be given in one-half grain doses every four hours.

If the wasting is checked give a tonic of thirty grains each of powdered fennel, anise, one dram each of coriander and cinchona, fifteen grains of powdered sulfate of iron, all well mingled and added to the mash feed at the rate of three or four grains daily. The mash may be made of wheat middlings, corn meal and rice flour, mixed with boiled milk, adding finely chopped boiled egg or boiled beef.

Atrophy of the Liver—Wasting of the liver, caused by chronic inflammation, may result in stupor or convulsions.

Prevent by feeding green food, balanced rations, and scattering small grains in litter to induce exercise.

Give fowl one-half grain calomel followed by twenty-grains Epsom salts in a tablespoonful of water.

After ten hours give two grains bicarbonate soda.

A one grain dose daily of naphthol or benzo-naphthol will tend to disinfect the intestinal tract.



A PAIR OF BARRED ROCK PULLETS

Courtesy W. S. Russell

Break Down—The muscles of the abdomen become weakened because of overfatness, fatty degeneration or disordered oviduct and the abdomen hangs down behind. If otherwise healthy kill and use for the table. Avoid by feeding less fatty or starchy food, especially Indian corn.

Broken Bone—Unless extremely valuable a fowl having a broken leg or wing may best be used for the table.

Bronchitis—Inflammation of the bronchial tubes may result from catching cold when exposed to chilly, damp, foul atmosphere, drafts or irritating dust. Whistling, rattling in the throat, gaping and excessive thirst are symptoms. In the first stages give tincture of aconite in one drop doses every five hours or give spirits of turpentine, ten drops, in a teaspoonful of castor oil every five hours until relieved. If purging follows discontinue the oil. Syrup of ipecac may be given to relieve difficulty in respiration. Flaxseed tea is excellent to relieve the trouble and is also nourishing.

Bumble Foot—Cushion of foot has a corn and develops an abscess. If neglected may extend to joints of leg and then becomes incurable. Caused by imbedded pebble, narrow perches, jumping from high perches to hard floor. Cut abscess and empty pus. Wash out with one per cent. carbolic acid solution. Anoint daily with carbolated vaseline until well.

Canker—White, gray or yellow patches grow on the lining membranes of the mouth or throat, swallowing painful. Inducing conditions are colds, catarrh, roup, exposure to chilling winds, drafts and filthiness. Keep the bird away from such conditions.

Canker spots may be treated by gently blowing dry powdered chlorate of potash through a glass tube or a straw upon them. Swabbing with peroxide of Hydrogen twice daily is beneficial. Calcium sulfid, one grain, three times a day may be given in a bread pellet. Feed very nourishing soft food, such as raw eggs, or bread soaked in milk or beef tea.

Catarrh—Mucous secretions form and collect in the

eyes, nostrils and mouth. The bird becomes drowsy, loses appetite, shows roughness of feathers, sneezes or wheezes. May follow catching cold or exposure to damp, chilly conditions, foul air, filthy food or water, and the attacks of parasites.

Place the patient in comfortable quarters away from the evil conditions just mentioned. Sunshine and pure air are correctives. Raw eggs or bread softened with milk and fresh green food will nourish and help the fowl.

If there is swelling of the parts of the head anoint with carbolated vaseline. Inject into the mouth and nostrils by the atomizer, several times daily, a solution made of extract of witch hazel, four tablespoonfuls, water two tablespoonfuls and carbolic acid three drops.

Choking—There is shaking of the head, straining and twisting of the neck. If a piece of bone or other hard substance obstructs the throat carefully locate it and seek to work it out through the mouth by manipulation with the fingers on the outside of the neck. A little sweet oil inside the throat may help matters but avoid stopping up the windpipe. If the obstruction can be seen in the throat it may perhaps be seized and withdrawn by means of the forceps or by the fingers.

Cholera—Contagious cholera of poultry is a very rare disease and is due to a specific cholera germ. The symptoms include looseness of the bowels, thin yellowish or greenish discharges, roughened plumage, drooped wings, contracted neck, drowsiness, excessive thirst, distended crop, pale comb and wattles, weakness. In the rapid form there is extreme exhaustion and death ensues within about two days after being attacked.

There is a chronic form which may continue several weeks.

Kill and burn the birds. Spray the surroundings, including the ground of the runs, with five per cent. solution of carbolic acid. Keep the liquid well stirred while spraying.

Colds—There is inflammation of the throat, nostrils

and eyes, thin watery discharges from these parts, oftentimes frothiness in the eyes, sneezing and shaking of the head.

Exposure to damp, chilly, stagnant conditions causes the birds to "catch cold" and this may, if not checked, lead on to catarrh, canker, bronchitis, pneumonia or roup.

Dry, comfortable, sunny, well ventilated quarters, active scratching for a part of their rations, pure food and water, green food to keep the bowels in order and freedom from parasites all tend to prevent colds.

Mix together one tablespoonful each of black pepper, ginger, mustard and flour, add lard enough so that the mixture can be formed into pellets of the right size to be taken by a fowl.

Keep a supply of these pellets in a closed glass jar. If a fowl shows running at the nostrils or eyes or frothy discharges in one or both eyes, becomes inactive or begins sneezing, give two or three pellets at evening to ward off the cold or to check its development.

Oftentimes when there is a slight watery discharge from the nostrils it will become evident by the dust collecting on it and giving the base of the nostrils a dark appearance. Watchfulness and prompt treatment will often save the fowls from the diseases which readily follow colds in the head.

Congestion of the Liver—Excessive fatness, sluggishness and inactivity are accompaniments of liver congestion. A post-mortem examination shows the liver to be enlarged, gorged and congested.

Overfeeding, unbalanced starchy or fatty rations, especially an abundant or exclusive corn diet, and close confinement, with little or no exercise, all tend to disorders of the liver. Correct these conditions and see that the fowls are free from parasites.

Congestion of the Lungs—The multitudinous blood vessels of the lungs become gorged with blood, resulting in partial asphyxiation by preventing the air entering the lungs because of the contracted air tubes or causing

rupture of the vessels and filling of the air tubes with blood.

Fowls that are exceedingly fat may have too abundant rich, thick blood in their veins and if excited to violent movement rupture of a blood vessel in the lungs may occur. In such case there is rapid, laborious breathing, succeeded by stupor and change of color of the comb and wattles to purplish or bluish hue. Death comes suddenly.

Avoid overfeeding the rest of the flock, include ample fresh green food in the rations, compel the birds to scratch for some of their food and protect them from all the evil conditions which tend to make them catch cold.

Constipation—If stoppage occurs from obstruction of the bowels or vent, remove any excrement that has attached to the feathers about the vent, softening the same with warm water or oil if necessary to loosen its hold.

Give twenty grains of Epsom salts in a tablespoonful of water or a teaspoonful of castor oil as a dose for an adult fowl. Feed bread soaked in milk, supply fresh green food and compel the fowls to exercise.

Consumption—This is a lung trouble that may be accompanied by fetid diarrhea. Egg production ceases, the body gets thin ("going light") the comb, wattles and skin become pale and there is weakness. The digestion is impaired, respiration may be rasping.

Destroy the fowls and disinfect the premises.

Corns—The sole of the foot becomes hardened from the same causes that produce Bumble Foot. Remove the irritating conditions, pare down the thickened cuticle and apply tincture of iodine daily until the inflammation is removed.

Crop Bound—Obstruction or impaction of the crop may result from eating long, wilted grass, feathers, strings or other indigestible articles or from gorging with food.

Give a teaspoonful of sweet oil, then manipulate the

crop contents with the fingers, from the outside. If the mass does not move down the digestive tube try suspending the fowl by the legs and work the contents of the crop back to and out of the mouth. After emptying the crop give no food for thirty-six hours but allow the fowl to drink a little water containing twenty grains bicarbonate soda to the quart. Then feed sparingly on bread softened with milk.

If a surgical operation becomes necessary in order to empty the crop, cut the outer skin near the upper part of the crop. An inch incision is large enough. Next cut through the wall of the crop. Empty the crop by using the forefinger. Wash out the interior with one per cent solution of carbolic acid.

Sew up the cuts with white silk, letting the thread ends hang outside. In a week if the wound is healed draw out the threads. Give for a day or two only water containing one or two drops of salicylic acid per quart, then feed for several days on bread soaked in milk.

Depraved Appetite—Unnatural craving may cause a fowl to gorge itself with food or to swallow substances unsuited to the digestive tract. This is liable to cause digestive disorders. Lack of grit may result in obstruction of the gizzard. Keep the fowls active on turf ranges in summer and supply straw litter in their runs during winter. Encourage exercise and supply abundant green food. Balance the rations. Keep granulated charcoal and grit within reach of the flocks.

If stoppage, indigestion or diarrhea result from a fowl seeking to satisfy a depraved appetite give it a dose of Epsom salts, twenty grains in a tablespoonful of water. Put twenty grains of bicarbonate soda in each quart of the drinking water.

Diarrhea.—Looseness of the bowels may be caused by digestive disorders or by a sudden chill. Diarrhea is liable to result from a sudden change of diet especially if animal food is given in excess. It may follow the overloading of the digestive system with green food, fermented food, damaged grain, filthy water or failure

to supply grit for the gizzard. Correct and regulate the feeding. Clean out the intestines by a purgative dose, one teaspoonful castor oil or twenty grains Epsom salts dissolved in a tablespoonful of water. After purging give water in which rice has been cooked, for drinking. Scalded milk will tend to correct looseness of the bowels.

Diphtheria—The throat becomes inflamed and yellowish areas form on the linings inside the throat. These patches attach tightly to the throat membrane, differing from the spots formed in canker cases, the latter being thick and cheesy. The canker membrane can be torn from the throat lining without much bleeding. The diphtheria membrane is almost impossible to separate from the throat lining. Treat as directed for roup.

Dysentery—Filthiness in food or water may bring on excessive looseness of the bowels. Diarrhea, if unchecked and aggravated by filthy conditions, may develop into dysentery. The frequent thin, liquid discharges are malodorous and may spread the disease. Separate any cases from the rest of the flock. Correct the conditions. Purge with Epsom salts. Feed as directed in cases of diarrhea.

Eczema—White pimples appear on the wattles, increase in size, run together, discharge and become crusted. Fowl is listless and loses appetite. Anoint the affected parts with oleate of zinc. Give two grains of calomel every second day for four times. Also a one grain pill of citrate of iron and quinine twice daily for a fortnight. Regulate the rations, give range on grass land and encourage exercise to stimulate digestion and blood circulation.

Enteritis—Inflamed condition of the mucous lining of the stomach (so-called) and the intestines resulting in acute diarrhea, caused by poisons, internal parasites, gorging, fermented food, condiments and filth in food or water.

Growing chicks and molting fowls are especially liable to enteritis attacks. Catarrhal inflammation of

the mucous linings of the intestinal tract may ensue. The excrement may appear greenish or yellowish and there may be looseness of the bowels.

Give olive oil one tablespoonful to a dose three times daily. Feed on bread soaked in milk and give milk to drink.

Eversion—Protrusion of the inflamed oviduct from the vent may follow excessive straining in trying to lay a very large or broken egg.

Bathe the exposed oviduct with one per cent. carbolic acid solution, apply carbolated vaseline and gently press it back into place in the body cavity.

Give Epsom salts twenty grains and bicarbonate soda two grains in a tablespoonful of water. Follow with one-half drop of aconite three times daily. Give three drops of extract of ergot. If the derangement persists and the fowl is in condition kill it for the table.

Fatty Degeneration—Fatty particles or globules take the place of the cell tissues of internal organs, such as the heart, liver, ovules, etc. The fowls become sluggish and excessively fat. Kill and dress for the table before the fatty degeneration has involved the vital organs. Avoid feeding the rest of the flock too much food, especially starchy and fatty nutrients.

Frost Bite—Freezing of the comb and wattles shows in stiffness and purple color of the frozen parts, which later change to black color and finally drop off. Thaw out gradually applying snow to the frozen parts.

After the frost is out apply twice daily an ointment composed of vaseline five parts, glycerine two parts, spirits of turpentine one part.

Gastritis—Inflammation or catarrh of the stomach (so-called) accompanied by roughened plumage, constipation, loss of appetite, exhaustion, drooping of wings, emaciation. There may be fever indicated by excessive thirst, and quickened respiration. Among the causes are excess of food, lack of grit, want of exercise, irritation due to condiments, pins, nails, or sharp substances of any kind swallowed by the bird. Purge with Epsom

salts or castor oil daily until the bowels operate freely. Feed bread and milk. Use bicarbonate of soda, twenty grains to the quart of drinking water.

Hepatitis—Inflammation of the liver with pale yellow skin, sluggish gait and failure of appetite. Diarrhea may be present.

Give one grain of calomel followed by twenty grains of Epsom salts in a tablespoonful of water. Ten hours later give two grains of bicarbonate of soda. A one grain dose of naphthol or benzo-naphthol twice daily will serve to disinfect the intestinal tract.

Inflamed Oviduct—Irritation of the oviduct causes straining or rubbing of the abdomen along the ground. There may be roughened plumage, paleness of the head appendages and stupor. The inflammation may be caused by excessive laying of eggs induced by feeding condimental mixtures or very stimulating rations. The fowl has difficulty in depositing her eggs or lays soft shelled or malformed eggs. If in good condition of flesh kill the fowl and use for the table.

Treatment in the early stages may prove successful. Give Epsom salts, bicarbonate of soda and aconite as described in treating *Eversion*.

Jaundice—Over production of bile and enlargement of the gall bladder may come from overfeeding with starchy or fatty foods. The skin becomes tinged with a peculiar yellow color. Bile may become absorbed into the blood vessels with deleterious results.

Correct the rations and supply plenty of grit. Purge with aloes, one half grain to a dose.

Leg Weakness—Weakness of the limbs is shown by unsteady gait, flapping of the wings to help support the body when walking, moving about on the hocks and squatting while feeding.

Rheumatism or injury may account for this condition in some cases but it is more often the effect of feeding unbalanced rations. An excess of starchy nutrients, a lack of protein, or deficiency in mineral matter,

especially the phosphates of lime for bone building may produce these results.

Forced feeding of young chicks even with balanced rations may cause too rapid growth.

Excessive dryness of the brooder floor, in the case of growing chicks, especially if there is much artificial heating beneath the floor, may conduce to leg weakness.

Correct the unfavorable conditions of feeding and surroundings, making them as natural as possible in order to avoid abnormal growth.

Pasting Up—Little chicks in brooders sometimes become plastered about the vent with dried excrement. This may be due to weakness of the muscles which expel the droppings. Such weakness may be owing to lack of stamina in the parent stock or to faults in incubation.

Soften the pasted mass with warm water or olive oil and after removal smear the parts with carbolated vaseline. To clear the bowels give the chicks each one-half teaspoonful of olive oil. If not effective add to the next dose a few drops of castor oil.

Peritonitis—The delicate lining of the abdomen becomes suddenly inflamed. There is loss of appetite, listlessness, painful attempts to pass droppings, rapid loss of strength until the fowl falls exhausted. The abdominal walls feel hot and tense to the hand. Such cases are usually hopeless.

Pip—A dry scale forms on the tongue due to breathing through the mouth when the nostrils are stopped, to deranged digestion or poor blood circulation.

Cure the cold or digestive disorder. Soften the scale with glycerine diluted with an equal quantity of water. Do not attempt to tear off the scale.

Pneumonia—There is acute inflammation of the air cells of the lungs due to sudden exposure to damp, chilling conditions. If one's ear is placed against the bird's chest a crackling sound in the lungs is heard. The fowl stands with drooping wings and pants for breath. There is high fever.

Give one drop doses of tincture of aconite every two

hours, keeping the patient in a closed cage or room where the air is made moist by vapor from boiling water, to which a few drops of carbolic acid or a few hops have been added. Feed with raw eggs or bread softened in milk.

Poisoning—May be caused by excess of common salt (chloride of sodium). Give as an antidote strong coffee or flaxseed tea.*

For arsenic poisoning, from swallowing Paris green or London purple, give boiled flax seed or white of egg.

To counteract the effects of poisoning by lead, copper, zinc or phosphorus give the white of egg or warm water sweetened with sugar.

Caustic soda, potash (concentrated lye) and nitrate of soda are deadly in effect if taken internally.

All poisonous substances should be kept safely locked away. A poisoned fowl, even in case of recovery, is likely to be injured for life.

Pox—Chicken pox shows on the head and underside of the wings little yellowish pox sores, round or oblong in shape. Accompanying these there may be pale combs and wattles, lack of appetite, weakness and sometimes blindness.

Isolate the affected fowl and keep in comfortable quarters. Rub the sore parts carefully but thoroughly with carbolated vaseline, twice daily.

Let the fowl's daily diet include finely cut boiled meat, green food and a mash of wheat middlings and corn meal, moistened with milk.

Disinfect the quarters and premises by spraying with five per cent. carbolic acid solution.

Rheumatism—When the limbs are affected by rheumatism a fowl usually has a jerky gait in walking and is inclined to squat upon the floor. Rheumatism more frequently affects old fowls than growing chickens. In some cases the joints show soft swellings, which gradually harden and may ulcerate.

Exposure to damp, chilling conditions aggravates this disorder.

Rub the swollen joints with camphorated sweet oil or carbolated vaseline.

A dose of Epsom salts, twenty grains, may be followed the next day by thirty grains of bicarbonate of soda in each quart of drinking water.

Also give twice daily two grains of salicylic acid.

Roup—Discharges at nostrils and mouth, frothy or running eyes, swelled head, offensive breath, diphtheretic patches in the throat, difficult breathing and swallowing, loss of sight and exhaustion are some of the signs of this scourge of poultry. It attacks fowls especially when they are weakened by parasites, by having caught cold, by catarrh and influenza. It is particularly liable to attack fowls when they are exposed to extremes of heat and cold, dampness, foul air, filthiness and neglect.

It is only in the early stages of this sickening disorder that treatment has any value. If a fowl catches cold or shows any of the symptoms indicated immerse its head in kerosene oil for a moment. A mixture of kerosene and olive oil, half and half, is less harsh in its effect upon the eyes. This mixture may be injected by means of an oil dropper or syringe into the nostrils and mouth. Peroxide of hydrogen and water, half and half, may be used in the same manner.

Creolin or carbolic acid in one per cent. solutions may be used in like manner.

Any of these liquids will help to clear the nasal and throat passages and destroy disease germs.

Keep the rousy fowl in a comfortable place away from the healthy fowls of the flock.

Feed raw eggs or bread soaked in milk or beef tea. If the eyes are affected it may be necessary to force the food down the gullet by hand in order to keep the bird nourished and prevent starving.

If swellings occur on the head and become filled with thick pus they must be cut open and emptied and the cavities disinfected by washing or syringing with one per cent. carbolic acid solution.

Even if a rousy fowl recovers it is liable to be again attacked by this disease. Fowls which have had the

roup should never be used thereafter for breeding stock.

Tuberculosis—In cases of tuberculosis there is development of internal tubercles varying in size from extreme minuteness up to the size of a walnut. These tubercles frequently form in the lungs but may develop in other parts of the body, particularly the spleen and liver. If the lungs are affected there may be rapid, troubled breathing, accompanied by some fever and sometimes wasting of the flesh. Diarrhea may attend the disease, increasing as the disease advances. The bones and their joints are sometimes involved and swellings form, causing lameness. Occasionally ulcerous growths appear on the surface of the body. Exhaustion finally results in death.

If tuberculosis enters a flock of fowls the only safe way to follow is destruction and burning of all the birds of the flock. The quarters should then be thoroughly cleaned and disinfected by spraying with five per cent. solution of carbolic acid. Even the soil of the runs should be disinfected. Expose the quarters to sunshine and winds for at least a month, or better, for a year before again attempting to keep poultry on the premises. A better plan is to choose another location for the poultry plant.

Vertigo—A rush of blood to the brain accompanied possibly by a slight hemorrhage may cause giddiness, staggering gait, walking in a circle, slight convulsions and throwing of the head up and back while the bird squats upon the ground. Old fowls, especially if excessively fat, are liable to attacks of vertigo.

The fowls may be killed and dressed for the table.

If it is desired to try to save a fowl affected with vertigo, correct the feeding by balancing the rations and including abundant green food, encourage active bodily exercise by scattering the small grains far and wide over the grass range or throw into straw litter in the house or yard. Relieve the head by applications of chopped ice or cloths wet with cold water. Give Epsom salts thirty grains and bromide of potassium three grains in a tablespoonful of water, three times daily.

Special Treatises on Poultry Diseases—In preparing the preceding notes on the ailments of fowls, the leading medical authorities on the subject have been freely consulted.

Credit is due especially to the authors of the following valuable treatises, which are heartily recommended to any students of the diseases of poultry, who wish to pursue the subject farther:

"The Diseases of Poultry," by D. E. Salmon, D. V. M., of America.

"The Diseases of Poultry," by J. Woodroffe Hill, F. R. C. V. S., of Great Britain.

"Medicine des Aiseaux," by Pierre Meguin, of France.

"Die Krankheiten des Hausgeflügels," by Friedrich A. Zuern of Germany.



PIONEER POULTRY CLASS, 1898.

CHAPTER VIII

Marketing

Successful sales, more than any other factor, determine the degrees of financial profit in the poultry business.

Whatever increases or diminishes the satisfactory selling of the poultry products deserves careful consideration by the poultryman.

THE SALESMAN.

It is one thing to produce good poultry and eggs and quite another thing to dispose of the same at a financial gain.

The quality of the successful seller comes by heredity to some men and women. Some excellent producers fail as sellers and some salesmen lack in the power to produce. Sometimes both qualities are found well developed in the same individual.

It is here that the characteristics of the trained business man come particularly into play in poultry culture.

Experience in the producing line is a very desirable part of the preparation for successful selling. The salesman should know all about the products.

The seller of the productions of a poultry farm must watch the market and make a study of the art of selling well.

He should be a good advertiser to sell advantageously some lines of poultry productions.

He aims to sell on a rising market *i. e.*, when prices are advancing rather than declining.

He should be shrewd at a bargain but honest and fair in all his dealings, if he would continue to make sales to his best customers.

THE BUSINESS.

The poultry business includes three quite distinct lines viz.: Producing, preparing and selling the products.

When poultry-keeping is conducted on a small scale these three branches are commonly controlled by one person—the poultryman.

When the size and extent of the business on a poultry farm or in a community of poultry-keepers warrants, it is often advantageous to separate the branches.

The producer bends all his energies and seeks to control all the conditions with the aim to make the best and most salable products. The collector and finisher seeks to obtain the best stock for his purpose and prepares the products with extreme carefulness.

The seller seeks to get the largest net returns by disposing of the finished products to the consumer.

If the poultryman must combine in himself the qualities of all three of these specialists, let him study the work of the experts in each of the three lines and so far as practicable adopt the methods which win success and profit.

The poultryman should at least keep posted daily as to market prices and conditions.

THE PRODUCTS.

The products of the poultry plant are valuable and should be prepared so as to appear attractive to possible purchasers.

These products should prove their value both by quality and quantity.

The purchaser is thus pleased at the time of buying and satisfied when the products are used. He comes to buy again.

The tastes of the consumer and the customs of the market should be kept in mind. It may be necessary to cater to the prejudices and habits of the consumer, even though the poultryman feels that the products thus furnished are lacking in some ways. The financial returns are the main thing and he can gradually educate his

customers up to something better and secure increased profit while eventually giving the buyer a more satisfactory article.

Certainly less profit and oftentimes loss results from the bad appearance of eggs and dressed fowl because of poor preparation for market. It costs but little if any more to finish the products according to the skilful methods of trained experts, and the prices thus secured greatly increase the net profits.

There is considerable variety in the kinds and forms of poultry products offered for sale.

EGGS.

The first object of many keepers of poultry is to secure an ample supply of nice, fresh eggs for home consumption. Millions of eggs are thus used and never come into the markets to be sold.

Great numbers of eggs are also used for hatching chickens to supply the table of the poultry-keepers. Quantities of eggs for hatching are also disposed of to parties who grow broilers and roasters for market. There is further a large trade in eggs of pure-bred and fancy fowls sold for hatching.

The bulk of the eggs produced, however, go to the great city markets. The demand is constant and the supply is regulated to a considerable degree by means of cold storage houses which hold the surplus until needed.

FOWL.

The home table requires a large number of fowl of those raised on the farms and in the yards of poultry-men.

Many pullets are sold to replenish laying flocks in towns and villages, where the poultry-keepers find it inconvenient or impossible to raise their own chickens.

There is also a large business done in selling breeding stock to poultry-keepers who wish to improve their flocks or desire to have pure-bred fowls only, in their

yards. There is a considerable demand also for exhibition and fancy fowls.

The mass of fowls sold, however, go as live and dressed poultry into the markets of the centers of population to be consumed as food. Poultry is a favorite article of diet in demand throughout the four seasons.

Squab-Broilers:—Chickens hatched in the winter months and confined to brooders or brooding houses can be grown rapidly for eight to ten weeks and will then weigh from three-fourths of a pound to a pound and one-half. These plump little birds are in demand as squab-broilers for the tables of hotels, restaurants and club-houses in some large cities.

Spring Broilers:—Chickens hatched in early spring and grown to a weight of two pounds are in good demand throughout the spring and summer season.

Fryers:—Chicks grown to a weight of about two and one-half pounds are much in demand in some sections for frying. In some markets, however, chickens weighing between two and three pounds are not desired.

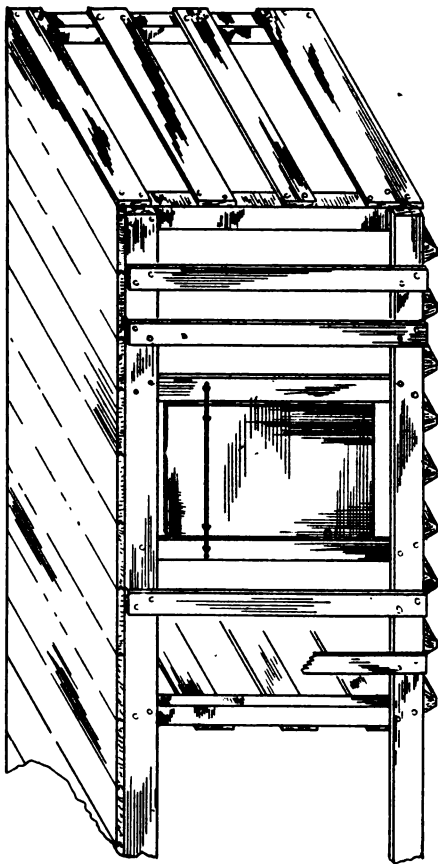
Small Roasters:—Chickens weighing three pounds or slightly over that weight sell well if plump and tender of flesh.

The favorite sizes of roasters sold in the fall range from three to five pounds weight.

Large Roasters:—There is some demand for roasters weighing eight to twelve pounds. Hotels and restaurants can use these sizes to advantage.

Soft Roasters:—A special trade has been developed in roasters grown from chickens hatched in late summer and early fall, kept growing well through the winter and sold in the spring. The cockerels are caponized and the pullets are marketed just before they would begin laying eggs. Very satisfactory prices are obtained for these soft roasters.

Capons:—Castrated cockerels retain tenderness of flesh and become plump, juicy fowls for selling during the late fall, winter and spring. Capons usually sell for an advance in price over cockerels. If fattened by the



FATTENING CRATE

FATTENING CRATE—Length seven and one-half feet, divided into three compartments, each two and one-half feet in length; height eighteen inches; depth eighteen inches.

MATERIAL—Posts for corners and where partitions are inserted are one and one-quarter inches by one inch stuff. Top and bottom rails are one inch by two inches. Slats for front are one-quarter inch by three-eighths and are set two inches apart. The top is of three-eighths inch matched lumber and is made tight. The bottom is made of triangular strips one inch in thickness, one and one-quarter inch in width at the base and one-quarter inch at the apex. (In the drawing these are shown two inches apart). The advantage of bottom strips of this shape lies in the fact that they make the coop practically self-cleaning.

Each compartment is provided with a door eight inches by twelve inches in size, made of

one-half inch stuff. A heavy wire, stapled both to the door and to the slats beside it, forms a hinge, permitting the door to swing inward. A staple driven into the slat near the bottom of the door prevents the latter from swinging outward. In order to economize space in the fattening building, these coops may be used in two tiers, the bottom of the first tier being approximately eighteen inches from the floor, and of the second tier eight inches above the top of the lower tier.

cramming method they make especially toothsome table-fowl and in certain city markets command an extra price.

IMPROVEMENT IN CONDITION.

Improvement in the quantity and quality of his products should be the watchword of the progressive poultryman.

A clean, new-laid, limpid, fine-flavored egg is a source of delight, while a dirty egg of uncertain age is very liable to occasion disgust.

The poultryman can certainly insure the freshness of his eggs by prompt collection. He can secure cleanliness of the shells by keeping fresh straw or hay in the nests, dry floors and neat arrangements in the laying house.

If pure, white-shelled eggs are desired, these can be obtained by the right selection of breed and proper housing, feeding and management.

If brown or tinted shells are in demand he keeps breeding stock that produces eggs of the desired color of shell. He further selects for breeders the best layers and those that yield eggs of desirable size and shape. By the use of trap-nests and careful rejection of non-layers, poor egg producers and layers of eggs of undesirable color, size or shape, a "brown-egg-laying strain" is soon established. Eggs of such fowl command the best prices in the brown egg market.

Breeding Stock:—A similar plan of selection will apply in case stock is raised to sell for breeding or exhibition. Improvement in fancy fowls as well as in birds yielding market products, may be made by using pure-bred parent stock of the best family to be found and proceeding according to the principles of breeding (See Chapter II.), selecting and mating judiciously, and culling courageously. Increased profit must follow in due time.

Market Fowl:—In growing chickens for market it is desirable to have a flock of breeders which produce birds

that are uniformly of one pattern and that of the best size and shape for the purpose.

After good breeding has laid the right foundation, expert incubating and brooding should provide chicks which, by proper feeding and skilful management develop thriftily. There should be no halting in growth.

Broilers are to be marketed while plump and tender, before there comes a reaction from the forced feeding in constricted quarters, and previous to the plentiful prevalence of pin feathers.

Cockerels intended for marketing as roasters should be caponized at about three months old. (See Chapter V.)

Roasters should be finished by one month of fattening in coops or small yards.

The autumn season is best suited to successful fattening of fowls.

The cramming method gives the birds a finish which can not be excelled. The cockerels or capons are confined in airy, slatted coops and fed the first week all they will eat from troughs. For the following three weeks the birds are crammed by hand or by machine with a fattening ration.

The weight of a chicken is thus increased from twenty-five to fifty per cent. and the quality of the flesh is immensely improved.

THE CRAMMING PROCESS.

Quiet quarters somewhat secluded and not too bright, are favorable for fattening.

To avoid loss of nutriment by exercise the birds are closely confined.

The fattening coops are made of slats one-half inch thick and one and one-half inches wide. The slats on the sides, ends and top are placed two inches apart, while those on the bottom are separated by three-fourths of an inch spaces. The Canadian fattening coop is made six and one-half feet in length, sixteen inches from front to back and eighteen inches high. This style has two



STUDENTS USING THE CRAMMING MACHINE. CRATES HAVE A CAPACITY OF 750 BIRDS.

board partitions, making three compartments, each large enough for five chickens.

A V-shaped feed-trough, three inches deep, made of boards of three-fourths inch thickness, is supported on notched end-boards, holding the trough in front of the coop just above the level of the floor. Vertical sliding doors, each of three upright slats nailed to a top and bottom cleat at the front of the coops give access to the compartments.

Healthy, well grown chickens of three to three and one-half pounds weight are well suited for fattening by the cramming process.

Gravel or other form of grit is supplied two or three times a week. Water is given twice daily and not left before the birds.

During the first week the chickens are fed from the trough all they will eat three times a day.

During the second, third and fourth weeks the birds are crammed twice daily. If at cramming time there is any food left in a bird's crop he is left unfed until the next meal. If a chicken gets out of condition he is given a teaspoonful of Glauber's Salts (soda sulfate) and turned out on a grassed run.

The food consists of very finely ground barley meal, corn meal, wheat middlings, oat meal and animal meal mixed with skim-milk or butter-milk. Buckwheat flour and finely ground millet are sometimes used.

A sample ration may be made of the following: Corn-meal by weight five parts; wheat middlings, four parts; ground oats, one part; animal meal, one part.

During the last week melted fat may be mingled in the paste, at first one-fourth pound, increasing daily until ten ounces per day are used for twenty chickens.

The food is mixed several hours before using, to a smooth, creamy paste of just the right consistency to flow when forced into the bird's crop.

There are a number of English and American cramming machines manufactured for sale. Usually a bucket-shaped reservoir holds the paste which passes as needed

into a cylinder and is forced by a piston operated by foot power into a metal or vulcanite tube. This feeding tube is about one-half inch in diameter and long enough to be extended down the fowl's throat to the crop.



Courtesy Aug. D. Arnold

In operating the chicken is held firmly between the left arm and the body of the feeder who holds the head of the chicken in his left hand the comb lying in the palm of the hand. The mouth of the bird is opened by

the thumb and index finger, the tongue is held down by the finger, the end of the tube is inserted and passed down the throat, which should be held straight. The right hand of the operator guides the end of the tube safely by the entrance to the wind pipe and prevents the tube passing too far into the crop. Pressing lightly with the foot on the lever forces the paste into the crop until it is full. The bird is then returned to the coop. The feeder should have an assistant to take the chickens, one by one, from the fattening coop, hand them to the operator and take away the chickens as fast as crammed.

IMPROVEMENT IN SELLING.

On farms where fowls are endured rather than encouraged, very primitive ways of preparing and disposing of the poultry products have sometimes been practiced.

The eggs were gathered when someone happened to think it time or when the cackling of a hen suggested that the search for eggs would be rewarded. Fresh eggs, old eggs, clean eggs, dirty eggs, partially incubated eggs—a miscellaneous collection—were put in a box or basket and taken on the next trip to the village grocery.

Naturally, not a very high price was obtained for such eggs and perhaps the goods taken in exchange, especially in the days before the food laws were in operation, corresponded quite closely in value to the heterogeneous eggs.

The chickens raised at random were caught before the holidays, the pullets reserved and the cockerels put in heavy crates or unwieldy boxes, and carted alive to a market and "sold for what they would fetch."

In some localities there was an improvement on this plan because hucksters came to the farm, bought the chickens at intervals and took them away, but the prices realized did not point to the profitableness of poultry production.

On many farms where these careless, neglectful, wasteful ways once prevailed there are now much better methods in vogue.

Frequently the change for the better has been the result of the thoughtful action of the housewife or of the farmer's boy or girl.

By the new plan the eggs are collected from the clean nests systematically, once or twice a day, kept at home hardly a day in a cool, sweet smelling room, placed in nice baskets or clean crates and promptly delivered to the dealer who pays cash at perhaps an advance of one or two cents per dozen on the market quotations.

The chickens are culled early and if there is a demand for broilers, the cockerels are killed, picked, prepared for sale and marketed. Thus there is a saving of food and labor for their further growth and they do not come upon the market later when the mass of dressed poultry is more than filling the demand.

A RETAIL ROUTE.

The next advance where the location and conditions warrant it, is to establish a retail route among good paying family customers. Such a business may be combined with a route for the delivery of milk, butter, vegetables, fruit or other produce or be run independently.

To start and maintain such a trade may call for courage and persistent, patient work, but it certainly pays a profit under favorable conditions.

The member of the farm family having in greatest degree the salesman's qualities is the one to attend to this part of the business.

It may require some personal solicitation to get the first customers and attractive advertising may be necessary to increase the trade but it does not take a very large number of families to consume the products of a poultry plant of considerable size.

The products themselves should advertise their quality. Sometimes a sample package of clean, fresh eggs or a plump chicken neatly dressed, will, if presented to a family, win a new customer.

To hold customers it is necessary that the supply of eggs and chickens be sure and sufficient, the delivery

regular and prompt and all the dealings fair and square in every respect.

The fresh eggs should be sorted so as to secure uniformity in filling each order as to color of shell, size and shape of eggs. There should be rejection of such as are of very large or very small size, irregular shape, imperfect shell and soiled or stained appearance. Slight soiling may be removed by a dampened cloth, when the egg is quickly wiped dry. If eggs become so dirty as to require washing the conditions of the laying house need correction. Buyers of eggs for cold storage houses reject eggs that have been washed as they consider the keeping qualities of the eggs to be injured by wetting the shells.

Eggs for a fancy trade, such as soda fountains, or very particular customers are sometimes stamped with the date of laying. A rubber stencil stamp answers this purpose nicely. The name of the poultry plant or its owner may be added if so desired.

Eggs may be attractively put up if placed in paste-board cartons. These little boxes have partitions, or "fillers," so that each egg is in a compartment by itself and may be transported in safety. The cartons, each holding one dozen eggs, may be packed in a crate for shipment.

Both cartons and crates are now manufactured in large quantities and sold very cheaply. Crates may be made for holding both eggs and chickens dressed for family supply and shipped to retail customers by express.

There should be in America, as in most progressive countries, a parcels post by which packages of this kind could be sent anywhere and quickly delivered at slight expense.

The cartons and crates may be marked in neat, clear letters with the name of the poultry farm sending the products and thus help to advertise the same. Chickens for retail family supply may be dressed according to the demand and each wrapped in white parchment or paraffined paper. The orders for both eggs and chickens may usually be filled once, or at most, twice a week in

running a retail route exclusively devoted to poultry products.

SPECIAL CITY TRADE.

A poultry farm which seeks to supply eggs and dressed chickens to hotels, restaurants, clubs, hospitals, asylums, private schools, etc., can usually secure good prices if equipped so that the quality and supply of its products will be unfalling.

Catering to such a demand calls for excellent business qualities in the poultryman as well as first-class goods for filling the orders.

The poultry plant should be large and well equipped. Its manager should be able to draw supplies from other farms whenever an extra large order calls for more goods than his plant can supply.

RETAIL DEALERS.

In the cities and large towns the leading grocers and provision dealers will often be glad to pay cash at prices a little above the market quotations for guaranteed prime poultry products regularly delivered.

A good time to start in securing such a trade is during the fall when fresh eggs are scarce and advancing in price.

By sending or delivering to the dealer a few samples of his products and showing positively that a given quantity will be regularly shipped, a bargain advantageous to both parties may be made.

By such an arrangement the producer avoids the trouble of filling numerous small orders and also reduces the expense of shipping and delivering.

COMMISSION HOUSES.

If the poultryman has not the time or inclination, or is not equipped for catering to private families, hotels, or retail dealers he may easily dispose of his products in the general market. It is not difficult to consign the eggs and chickens to a commission merchant and if the

returns are not high the expenses of this form of shipment are also moderate. The poultryman should watch the fluctuations of the market and ship only when the conditions are favorable. The merchant will usually supply a regular shipper with weekly published market quotations and the poultryman will also find them in the newspapers. If the producer finds a good commission merchant, who handles his products well, sends prompt returns at fair prices and treats him right as to crates, breakage, etc., then this method of marketing may prove very satisfactory.

If the poultryman's goods are first class and sent in good condition regularly he may get an advance on usual market prices.

Reliable commission men, who do a large business in prime poultry products, appreciate highly the consignments of poultrymen who send them only the best eggs and chickens, regularly and in large quantities.

BARTER OR EXCHANGE.

If the farmer finds it undesirable to dispose of his poultry products in any of these ways he may still be able to secure better returns than by following the old way if he will see to it that the eggs are clean, fresh and frequently delivered to the village dealer.

The chickens may well be sold before the bulk of the poultry goes upon the fall market.

By keeping posted as to market prices he may at least avoid being beaten down in price by an unscrupulous dealer.

He may also become posted as to the goods which he takes in exchange for his products. Local grocers are usually willing to supply standard goods of the brands desired.

The bulletins and reports of the department of agriculture, the experiment stations and state food commissioners or inspectors will keep the farmer and poultry-keeper informed as to brands of food that are adulterated. In exchange for his good eggs and chickens the

producer certainly should obtain reliable, valuable, undulterated goods. It is his own fault if he fails to do so.

SYSTEM IN MARKETING.

In some sections where the quantities of poultry productions warrant it collectors gather frequently and regularly the eggs and fowl from the numerous farms and poultry yards.

The eggs are sorted, packed and shipped promptly to the best market available.

The chickens are prepared by fattening, finishing, killing, dressing and packing. Then shipments are made so as to meet demands and not glut the market at any point.

Co-operation is coming into play in the disposal of eggs and fowl in some sections.

The producers unite to protect their interests and by their organization control the output of poultry products. In Ireland, for instance, eggs are thus collected and sold very successfully. The guaranty of the association goes with every egg and helps its price in the market. The benefits to producer, handler and consumer are material.

In Australia poultry products are sold at auction in certain large markets. The price thus obtained depends upon supply and demand, considering also the quality of the products.

In many of the world's large cities the producers sell in the "market place" to customers who come and buy their supplies for the table on "market days." Competition is free, supply and demand regulate prices to a considerable extent and quality of the products always counts for a good price. A pleased purchaser will usually come again to buy.

SELLING LIVE FOWL.

In some city markets there is a good demand for live fowl. The quotations often make it possible for the producer, not too far away, to sell his fowls alive at as

good prices as if killed and dressed. In cities having a numerous population of Jewish people, there is at certain seasons a particular demand for plump, live fowl. It is well for the poultryman to post himself as to the times when his live fowl will be wanted at good prices, fatten his birds in preparation for such seasons and dispose of his stock to advantage.

Live fowls are usually shipped to market in shallow, slatted crates. The ordinary size is six feet long, four feet wide, and one foot high. The slats are from an inch and a quarter to an inch and a half wide, placed about one and one-half inches apart and nailed firmly. A partition in the middle makes the crate capable of carrying chickens with added safety as it prevents excessive crowding or crushing of the birds when the crate is recklessly handled en route. The crate has a slatted door in the top. The fowls should be fed well just before shipping, unless very near market.

Great numbers of breeding, laying, exhibition and fancy fowl are sold which go to customers who wish to use them for the various purposes indicated or to keep them for pets.

For the transportation of such birds special shipping coops are manufactured which are usually smaller and higher than the marketing crates before mentioned.

Light, strong shipping coops are made of wooden or iron rods or large wire except the bottom, which is boarded.

Slatted coops are also used. Cotton cloth or ducking may be used to cover the top and sides of the coop to protect the live birds from draughts or chilling during transportation.

The door of the coop is usually midway at the front and may be made to slide up and down.

DRESSED FOWL FOR MARKET.

On a poultry farm which provides dressed fowls for sale there should be a house or room set apart for killing picking, dressing and packing the fowl in preparation

for shipment. The room should be well lighted and may well be located contiguous to or near by the cold storage compartment or cooling room. It should not be far from the headquarters or office. It ought to be capable of easy and thorough ventilation and must have an abundant supply of water. The loft of the house in which the killing and picking is done may be used for the drying and storage of feathers, the storing of shipping crates, etc. Before killing, the fowls should be starved for twenty-four hours, to empty their crops and reduce the contents of their intestines.

KILLING FOWL.

The fowl to be killed should be suspended from hooks or nails so as to be at the right height for easy operation. The two legs have each a cord attached by a loop which is readily slipped on or off over the foot and at the other end a hook or loop is attached to the nail above.

The head of the fowl is held in one hand and a sharp pointed knife in the other. The fowl is bled by a quick cut across the roof of the mouth back where the arteries enter the head. A thrust is then made through the natural slit in the roof of the mouth into the bird's brain. Next attach to the lower mandible a little pail having a narrow mouth and provided with a wire hook for attaching to the bill through its middle.

PLUCKING.

If picked dry the feathers should be stripped from the fowl's body as quickly as possible after the brain is pierced by the blade. A box or barrel for the large wing and tail feathers and another for the soft feathers should be placed handy. A basin of water near by may be used to wet the fingers if necessary.

The large feathers may be torn out first, and then the feathers along the breast, base of wings, neck and legs, where the skin of the fowl after picking presents a somewhat rough or "goose flesh" appearance. These

areas of the surface of the fowl's body are the places where the skin tears most easily. The feathers of the back may usually be rolled off by handfuls. The maturity or ripeness of the plumage helps greatly in picking clean and the chicken should be killed when pin feathers are not too plentiful.

If any stubs of feathers remain, use a knife blade. Catching the stub between the blade and the thumb enables the picker to remove the stub easily. If however, this plan fails the skin over the quill may be slit and the stub is readily extracted.

Scalding—Some markets will take scalded fowl and if properly done the operation of picking is thereby rendered very easy. Water at boiling point, but not actually boiling is used.

The fowl after killing is held by the head and feet, dipped into the hot water, lifted up and down several times and then hung up by the cords attached to the feet.

The feathers are rolled off speedily, care being taken not to bruise or start the skin. If even the scarf skin is loosened or rubbed off these spots will turn dark in color and the appearance of the dressed fowl will be very much injured. The head and legs should not be scalded.

To plump the picked fowl and greatly improve its appearance, the carcass is plunged into cold water after being dipped in scalding water. It may be left ten or fifteen minutes in the cold bath and is then hung up by the legs to dry and cool.

COOLING.

Whether dry or wet picked the body of the fowl should be very thoroughly cooled before it is packed for shipment. If any animal heat is left in the carcass the flesh may spoil.

The fowl may be hung up in a cool place until all the body warmth has escaped. In hot weather if the fowls are to be packed in ice for shipment, they may previously be kept in cold water until cooled to the temperature of the water and then in ice-water until packed.

DRESSING.

Fowls are dressed according to the demands of the market in which they are to be sold.

The largest city markets take the birds with heads and feet on and undrawn. Some markets require the removal of the heads, in which case the skin of the neck should be drawn forward and neatly tied over the neck bones.

Some markets demand that the fowls be dry-picked, while others expect the fowls to be scalded before picking. The American and French markets require that the fowls be bled. The English custom is to dislocate the neck where it joins the head, the blood collecting mostly at the place of dislocation.

If the skin of the fowl should be torn in picking it may be neatly sewed together with white thread to save the appearance of the carcass. Any blood clotted in the mouth should be wiped out.

SHAPING.

In preparing dressed fowl for the European markets the bodies are usually shaped or pressed into compact form by means of shaping frames and weights.

If the breast bone projects beyond the muscles it may be beaten down by the use of a smooth wooden paddle. The breast meat may be worked forward by the thumbs and a plumper appearance given to a carcass which lacks roundness. If further shaping is deemed desirable the bird is placed on a V shaped trough. The back-board of the trough is about six inches wide and set vertically. The front-board is nailed at an angle a little less than a right angle to the lower edge of the backboard. The carcasses to be shaped are taken before they cool off and placed side by side, breast down, on the front-board, the rear end of the body of each fowl pressing against the back-board, the head and neck hanging over the edge of the front-board.

A smooth board four inches in width and of the same length as the trough-boards, is placed on top of the

carcasses, just back of the wings. On this top-board are placed weights sufficiently heavy to press the fowls compactly together.

After several hours the bodies become cool and rigid and present a plump, blocky appearance and all look very much alike.

In France shaping is accomplished by means of individual boards and linen cloths. A fowl as soon as it is completely picked is placed, with wings and legs forced close to the body, in a fine linen wrap which is enclosed within another and coarser cloth. The outer wrapping is, by means of tapes, drawn tightly into the shape desired, then dipped into cold water and left for a day or longer in a cool place. The result is a smooth-skinned, plump, attractive-looking carcass.

PACKING.

Where large quantities of fowl are to be shipped to market they may be packed in barrels. Boxes are also used for this purpose.

The fowls should be graded so that the contents of each package will be uniform in size, shape and tint. If a box is used it should be of the right size to contain the carcasses and packing material without slack space. In cool weather the fowls may be packed dry in the cases.

Use a dry cloth to remove any moisture or stains found on the bodies. The case is lined with heavy packing paper or clean rye straw. Lay the birds in the box, two rows together, on their sides, those of each row back to breast, spoon fashion, the legs of the fowls of one row passing between the bodies of the other row, all compactly pressed together.

A layer of bright straw is placed over the two rows of chickens, then another layer of fowl, and over that straw enough to fill the box full after the cover is nailed on.

If a barrel is used and the weather is warm, a layer of broken ice is put in the bottom. On the ice is placed

the first layer of chickens, next a few inches depth of broken ice, then layers of chickens and of ice, until the barrel is filled. The chickens are laid with breasts down, feet to the middle of the barrel and heads towards the staves. Ice is piled on top and over this two layers of burlap cloth or bagging which are held in place by driving the uppermost hoop of the barrel over the cloth and nailing fast.

Every package should be plainly marked with the address of the consignee and also of the consignor. The number of packages and the weight of the chickens should also be stated on each box or barrel. Advice by mail should be sent before or at the time of shipping to the consignee.

SHIPMENT.

Packages of dressed poultry (and crates of live fowl as well) should be forwarded in season to reach their destination certainly not later in the week than Friday morning.

As poultry products are perishable the shipment is usually made by express. There should be careful studying of the shipping routes available, by the poultryman. Carriage by boat is usually the cheapest and best where it is possible. In deciding as to choice of route for shipment consideration should be given to rates charged, care in handling, promptness in delivering and fairness in settling damages, if such occur.

Finally the poultryman must look sharply after the prompt payment for his products, rendering his accounts to customers regularly and compelling cash settlement.





S. C. BUFF ORPINGTON

Courtesy Alf. A. Ziemer

CHAPTER IX

Housing and Fencing

CHOICE OF LOCATION. The location is fundamental in poultry-keeping, whether one building or many be constructed. It is the base and basis of the business.

A bad location will usually wreck the undertaking. A good location furnishes the foundation for building up a successful business. This matter demands careful consideration if the poultryman would start right.

Land, buildings and fences cost money. The investment is in the form of fixed capital, which is difficult to draw out and altogether too valuable to be sacrificed.

If the location be already fixed by circumstances beyond the power of the poultryman to change, then he should consider whether it be possible to improve the conditions if these be faulty in any respect.

If the poultry-keeper is so situated that he may set apart a portion of a farm for poultry he has the duty of studying the different portions of the farm as to their availability and adaptability for poultry culture.

If the prospective poultryman has unrestricted opportunity to choose his location where he pleases and sufficient capital to secure the land and establish the poultry plant he has the greatest cause for earnest study of the subject in all its bearings. He should neglect no important point because an unsuitable location is one of the worst obstacles to contend against in the poultry business.

POINTS IN LOCATING.

CONVENIENCE. First is convenience, which really signifies economy. Inconvenience of location involves loss

of time, profitless labor and constant annoyance of manager and men.

Supplies of building materials should be available and not too costly.

The location should be such as to allow of the best arrangement of the buildings, fences, roads and paths.

There should be easy and direct means of communication with a good public highway.

CLIMATIC CONDITIONS. So far as possible the location should be free from extremes of cold and hot seasons or weather.

Sudden changes in the weather, especially if they bring excessive rains and chilliness are very unfavorable to fowls.

The conditions of the weather during all of the seasons should be known and kept in mind. Summer's sultry heat in some sections is as debilitating as winter's bitter cold. Severe winds cause the fowls discomfort and discourage their ranging in the fresh air.

The amount and direction of the winds and storms liable to prevail in the locality should receive attention.

The atmospheric drainage should be studied. The air always contains moisture varying in degree from a slight amount up to saturation. When the moist air is not driven by winds it tends to form currents which move down the slopes and then settle in the lowlands, valleys and swamps. These movements of the atmosphere in damp condition take the same general direction as the water which after a rainfall passes over or through the land, seeking the lower levels, where both stagnate and produce unhealthy conditions. Heavy vapors in the forms of fog and mist are especially unfavorable to the health of fowls and are very conducive to poultry diseases.

A close, sultry atmosphere is objectionable. A location should therefore be chosen for the poultry plant that is not so level or so enclosed as to prevent proper atmospheric drainage. If the place is somewhat elevated there will be movement of the moisture of the air as

well as of the waters of the land and hence healthful conditions.

In northern latitudes slopes to the south, southeast and southwest secure the advantage of more direct sunlight in winter than other aspects.

If storms and winds are prevalent in the locality a place should be sought out which is naturally protected by higher land and trees of the forest or orchard. If these natural windbreaks are lacking the poultryman should ascertain the possibilities for planting hedges to the windward of the poultry plant. Fowls ought to be out of doors ranging in pleasant weather rather than standing still and moping in confined quarters.

Nearness of lakes or other large bodies of water may be an advantage if the climate is, by such influence, made more even in temperature. Sometimes, however, winds and storms sweep over these water levels and strike the poultry plant with especial severity.

SOIL AND DRAINAGE. A heavy clay soil may not show its undesirable character in dry summer weather, but if seen under conditions of wetness reveals its unfitness for poultry culture.

The rains falling upon such a soil do not quickly enter the land but tend to overflow it, to form gullies and gradually saturating the upper layer cause the surface to become muddy, sticky or slippery. Great discomfort to the poultryman and his fowls is liable to result. The droppings of the birds scattered over the land failing to enter the soil, become soaked by the rains forming a pasty mass which in dry weather forms a filthy crust over the surface of the yards. On a clay soil the sills of the houses tend to rot away and fence posts decay rapidly. If snow falls upon the land it sticks and stays and finally melting produces very unpleasant conditions under foot.

Such soil on a poultry farm, however, is usually capable of producing excellent crops of grass, grain and fruit.

Clay land may be greatly improved for poultry pur-

poses by tile draining or by mixing sand with the surface soil.

The conditions are vastly relieved by making good roads and paths about the plant.

A sandy loam soil is most suitable for poultry-keeping. The rain falling upon it enters promptly and percolates through the soil to the lower layers. The surface is always dry under foot for the fowls and their keeper. The soil water is held by the loamy part of the soil for the use of growing grass or other crop and the excess of moisture readily drains away.

The droppings of the fowls are quickly carried by the rain water into the soil where they form excellent fertilizer for feeding any crops that may be grown upon the land.

The land for poultry may be rocky or have growing upon it bushes and trees. It need not be very fertile but should be capable of producing at least sufficient grass or other succulent crop to supply the fowls with green food.

WATER SUPPLY. While stagnant moisture in the soil and atmosphere of the poultry plant are certainly undesirable, a supply of fresh, pure water in plenty and brought in constant flow to the fowls is ideal.

A perennial stream flowing through the poultry farm provides a means of effective natural drainage and may furnish an excellent, continual and economical supply of good water.

The poultry farmer is fortunate if he can secure a location having such a stream. He should ascertain if it is possible to dam the waters of the stream or connect with a spring above the poultry plant and by a system of water pipes conduct a supply to all parts of the plant by gravitation. If the source of supply is not sufficiently elevated to thus furnish a constant flow, it may be convenient to utilize a water-wheel, wind-mill, hydraulic ram, gasoline engine or alcohol engine for pumping the water to a reservoir, tank or stand-pipe. A system of

pipes can then be laid for carrying the water to all parts of the plant where the liquid is needed.

It should be possible to convey the waste water and sewage by drain-pipes to discharge into the stream below the poultry plant. The more nearly automatic the system of water supply and disposal can be made the more desirable is the location so far as this important factor is concerned.

NEARNESS TO MARKET. Since the profits of the poultry business depend very much upon successful sales, the location which gives easy and economical access to a good market is most desirable. Especially is this true if a retail route is to be supplied with first-class, fresh, poultry products. Every step of man or horse saved tends to reduce the running expenses of the plant.

Another important point is to locate within easy reach of a market where supplies for the poultry plant are readily and cheaply obtainable. It is a very great advantage to be able to load both ways, carrying poultry products to market and bringing back necessary supplies on the same trip.

TRANSPORTATION FACILITIES. In looking up a location for his business the poultryman must not forget to investigate the possible means of conveying his products to market. Steamboat lines, railroads, express companies, trolley expresses, wagon expresses and the conditions of the public highways throughout the year are items in the problem of transportation. If competing lines are available so much the better for the location.

OWNERSHIP OR RENTAL OF THE LAND.

After due consideration of all the points involved, having selected the best location possible the question of purchase or rental may arise.

If the poultryman has gained a thorough knowledge of all the local conditions and is satisfied that the location is well suited to his purpose he may well conclude to purchase the land.

As owner he will be most interested to establish a substantial poultry plant and to improve the place in a

progressive way. His buildings and other structures will be put up for a permanent purpose. He will seek to make the place attractive. Every step taken will be with the desire to make the poultry plant successful.

If on the other hand, the poultryman has not had experience in poultry keeping under the conditions of the selected location, it may be a wise plan for him to lease the land for a term of years, with the privilege of purchase. The price and terms of purchase should be stated in the contract.

If the location proves all that is desirable, purchase can then be made at convenience. If the local conditions are found, in practice, to be unfavorable to the successful conducting of the business, the buying of the land may be avoided and at the expiration of the term of leasing another location may be sought.

SITUATION OF BUILDINGS.

In selecting sites for the structures of a poultry plant the points which have been considered in choosing the location should be kept in mind.

The buildings should be conveniently situated in relation to all the details of the plant and of the business.

They should permit of the accomplishment of the labor of the plant with the greatest possible ease and economy.

In places having an even, equable, mild climate buildings for poultry may be required only for keeping the birds safe from enemies. Very simple structures should fulfill this purpose.

In locations where the changing seasons bring extremes of temperature and violent variations in the weather, it becomes necessary to provide shelter for the fowls against such of the conditions as would cause them discomfort or endanger their health. Each building should have a site, if possible, on land somewhat elevated and certainly well drained. Thorough drainage of the land on which the house is to be situated is so im-

portant that, if the soil is not somewhat sandy and thus naturally well drained, it is well to select a site which can be readily drained by tiles.

Advantage should be taken of the protection of higher land, trees, other buildings, hedges, etc., to help create an inviting climate within the houses to be inhabited by the fowls.

In northern latitudes poultry houses are usually placed fronting to the south, south-east or south-west, in order to get the full benefit of the sunlight in winter. During the cold season on bright days the first rays of the rising sun should strike into the house. The sun, running low, shines into the front of the house all day and the last rays of the setting sun help to make the interior of the hens' abode bright and comfortable at the close of the day.

The direction of the prevailing winds should be noted and the back of the house, if practicable, so placed that the windows, doors and yards at the front or sides shall receive shelter from the building itself.

STONEBURN BROODER HOUSES.

The distinguishing features of the Stoneburn brooder house plan are the depressed alley-floor and elevated chick-floor, the latter being three and one-half feet higher than the former. The original house as built was fifteen by thirty feet in size with a four by five feet extension at the east end, the latter forming an entry so that the attendant may pass in or out without admitting draughts of wind in cold weather.

The alley way, four feet in width, extends the length of the house. The chick-floor is divided into six pens five feet by eleven feet in size.

Individual indoor brooders are used, one for each pen. Miss Frances E. Wheeler of Clover Nook Poultry Farm, Chazy, N. Y., attaches a strong cord to the cover of each hover, carrying the cord up to a pulley attached to the ceiling, and thence out to the alley. By pulling this cord the cover is raised, and the hover's interior

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exposed for investigation. Releasing the cord allows the cover to drop into place on the hover. Miss Wheeler has brooded one thousand ducklings in a house of this kind with a mortality of only seven birds.

The elevated chick-floor places the chicks near the ceiling, the warmer part of the house, reduces the en-

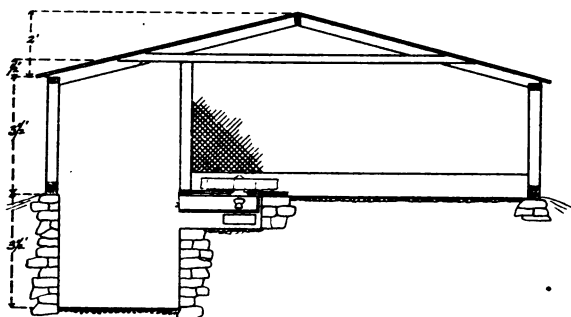


COMBINED LAYING AND BROODER HOUSE.

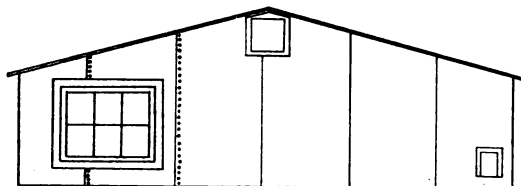
Courtesy F. H. Snow

closed air space and effects a corresponding saving in the amount of heat required to maintain a given temperature.

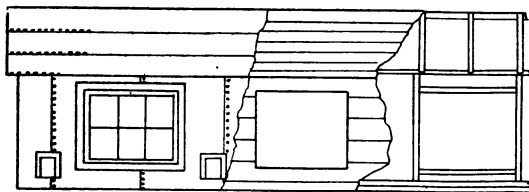
The lamps of the several brooders are easily attended to from the alley-floor without continual stooping.



Cross Section



West Elevation



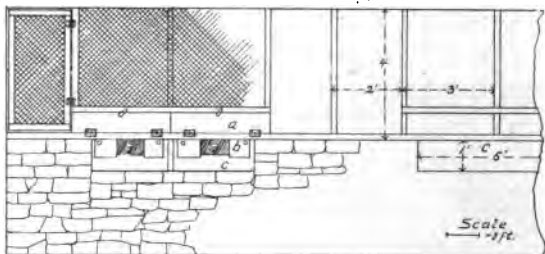
South Elevation

STONEBURN BROODER HOUSE.

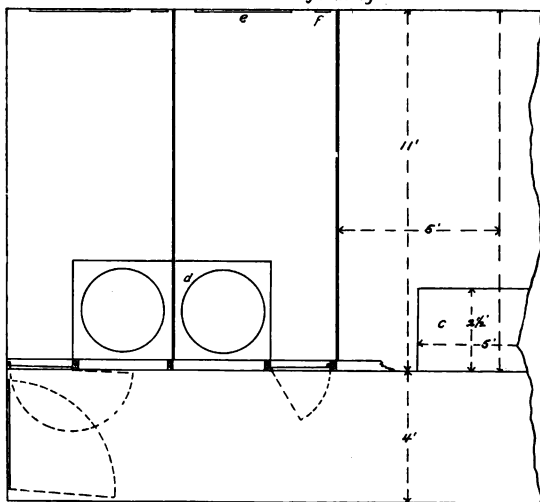
In the south side of the building are six windows, one for each pen, each a single sash with six panes of ten by twelve-inch glass. These windows are hinged at

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the bottom, and swung inward, being controlled from the alley by cords. At the west end of the alley another window of the same size is placed. This lights the alley thoroughly, which is very desirable, particularly on



Section through alley.



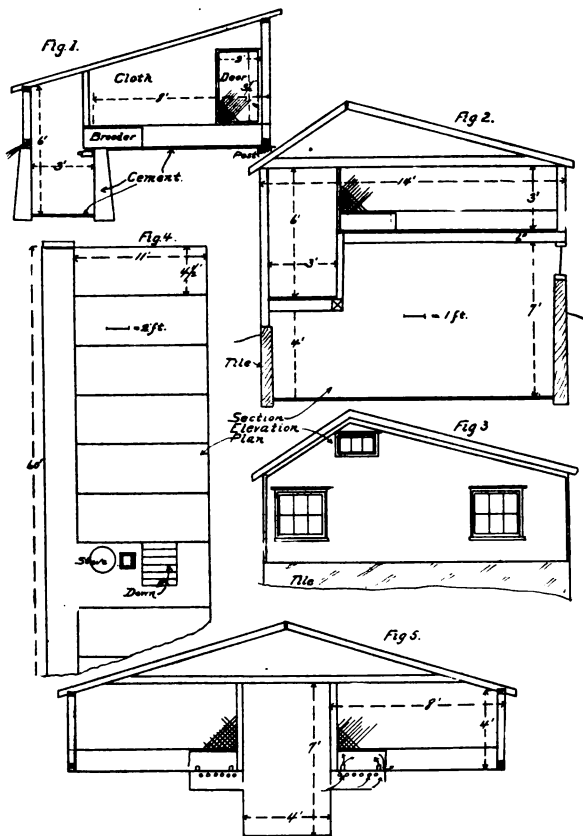
Plan.

STONEBURN BROODER HOUSE.

dark, winter days. Chick doors are six by seven inches in size, and are also operated by cords. The construction of pen partitions is so fully illustrated by the cuts that no further explanation seems necessary. The

door is made nearly as wide as the alley to permit the easy passage of wheel-barrows for cleaning.

Figure One. This house was built in New England and was equipped with Model brooders. Figures two,



STONEBURN BROODER HOUSE.

three and four illustrate a more ambitious structure. This was put up upon a big poultry farm in the western part of the Empire State, and was used merely as a

nursery brooder, the chicks being kept here a fortnight or so and during that time not permitted to get out upon the ground. The house as built is sixty by fourteen feet. The basement is divided into two parts by a tight wall, one being used as an incubator cellar and the other root cellar. The alleyway is practically suspended in the cellar, the floor being high enough from the cellar floor to permit a row of incubators being set underneath.

Figure five represents a house building in Pennsylvania. The idea of this house is to enable one man to attend to a large number of birds. It is designed for the production of broilers in the winter-time and ducks in the spring.

ARRANGEMENT OF BUILDINGS.

The arrangement of buildings should provide for easy communication with the office or dwelling of the manager, ready access to the highway and direct passage from building to building, without retracing or wasting of steps.

The appearance of the buildings and of the poultry plant as a whole should be made attractive and thus advertise the business in a very pleasing and effective way.

Even if there is to be only a single hen house on the place the selection of a suitable site is worthy of careful study. The relation of the building to the dwelling house and other buildings of the estate, the convenience of the poultry keeper and the comfort of the fowls should not be neglected.

If several or many buildings are to be erected on the farm or poultry plant the choice of a convenient central site for the headquarters building and the grouping of the various structures in relation to this point and to each other will demand some study. A plat or plan of the plant should be drawn, showing the boundaries and contour of the area and also indicating the position of any streams, trees and other fixtures that are present.

Even if all of the buildings are not to be constructed at once the site for each should be selected and the position marked on the map.

The decision as to what buildings and how many are needed, having been made by the proprietor whose capital is to be invested in the plant, their arrangement is next to be settled.

On a farm some of the buildings already erected may be utilized for poultry purposes, in which case the arrangement of such special houses as are to be erected may be a very simple matter.

In establishing plants to be devoted exclusively to the poultry business the kind and number of buildings required depend mainly upon the special line of production to be followed.

In any case the arrangement of the buildings becomes a special problem to be solved by the poultryman according to all the conditions bearing upon the question.

If a central building is required for headquarters it may include, besides the office, a room or rooms for sleeping apartments of assistants if such be needed.

The basement of this building may be used as an incubator room.

The brooder house should be situated near at hand.

A building may also be located quite close to headquarters to include a feed-room, work-shop, killing and picking place, packing and shipping room and granary.

If a reservoir or tank for water is required it may possibly be best placed in the upper part of this building.

In case a wind-mill is erected it may be thought best to locate the water-tank in the frame-work of the wind-mill tower.

Having located all of these structures in a central group the hen-houses may be arranged in rows so that the attendant in feeding and caring for the fowls can pass from the feed-house or room to one house or pen after another, without retracing his steps and end his trip where he began it. For example if ten houses are

to be placed they may stand in two rows extending away from the feed house. The attendant passing out one row and back the other loses no time returning on his tracks.

PARTICULAR POINTS AS TO HOUSES.

There are certain points applicable to all hen-houses.

1. DRAINAGE. Never place a poultry building in a hollow or where the floor will be lower than the level of the land outside.

The sills should be sufficiently elevated above the well drained site to allow of the floor being placed six inches, at least, above the level of the ground about the house. If by any means water gets into the house it will then tend to drain away and not settle beneath the floor.

2 VENTILATION. The fowls which inhabit a poultry house have lungs made for the breathing of pure, fresh air, which should be supplied in abundance, without exposing them to strong, direct drafts.

If the climate is not too severely cold in winter the front of the hen-house may be simply covered with wire netting (of one inch or three-quarters inch mesh to exclude English sparrows.) If storms are liable to beat in at the front of the house, the wire netting may be covered, when necessary, by frames of curtains of bur-lap, canvas or cotton cloth. Should further protection be required in severe winter weather, board shutters may be used. Some of the shutters should have windows so that, when in use, the interior of the house will not be too much darkened.

Another plan for the house-front is to use frames covered with cotton cloth in place of glass sashes for the windows.

A third plan is the straw-loft. When a house is tightly built and has glass windows this is an economical means of very effective ventilation. The ceiling of the hen-house is constructed of laths, strips of board, scantling or poles, placed two or three inches apart. Upon

this open work is laid a layer, one to three feet deep, of dry straw, hay, pine boughs, or branches of deciduous trees cut in full leaf. If more convenient one or more layers of sacking, burlap or cotton cloth may be laid upon the ceiling strips. In each end of the loft a window or ventilator is provided and these are kept open continually, except, perhaps, in blizzard weather, when the ventilator to windward may be partially or wholly closed.

The wind driving through the loft from end to end, draws out the foul air from the apartments below and fresh air sifts down through the straw without creating strong drafts.

The surplus moisture of the air is taken up by the straw and all danger of dripping water or white frost on the interior walls of the house is avoided.

A very simple and sensible method of ventilating a house which has windows of two sashes is to raise the lower sash six inches and fill the space below the sash with a board. The air may then enter or pass out at the middle between the sashes without direct drafts disturbing the fowls.

If it is desired to use ventilating flues an excellent plan is to conduct the air into the room or house by a pipe which passes from the outside into the house near the floor and then extending upward has its opening near the ceiling. The pipe for conveying out the foul air should start near the floor and pass up through or above the roof.

In case of a brooder house or other building having a chimney or smoke-flue, it is well to place one of the ventilator pipes close to the smoke-flue. The air of the ventilator pipe becoming warmed must rise and thus there is forced ventilation of the apartment.

In warm weather or in a mild climate where the conditions allow, the hen-house should be thrown open to the free air. Doorways, window spaces and other openings, if need be, may have a covering of wire netting

which for easy manipulation should be tacked upon frames to be held in place by hinges or buttons.

If a hen house is close and unventilated or poorly aired in sultry summer weather the birds should, if practicable, be allowed to roost out of doors. The trees of an orchard provide ideal perching places for old fowls or growing chicks during warm weather.

3. TEMPERATURE. By means of houses we seek to surround the fowls with an artificial climate during a considerable portion of the year. If the severity of the winter be thus modified and the conditions made sufficiently comfortable the fowls require less food to maintain body temperature and continue egg-production.

A house for hens should be sufficiently warm to prevent the freezing of combs and wattles and the crusting of the drinking water with ice. The conditions of humidity and ventilation are closely related to the matter of temperature. Fowls will keep comfortable, thrive and lay well in an atmosphere that is quite cold if the air is dry or free from excess of moisture and supplied without strong direct drafts blowing upon them. A house with dry floor and tight roof, back and sides may have an open front and the fowls do better than if kept in a close, ill-ventilated apartment. During very cold nights, when the birds are quiet on their perches a curtain of burlap dropped in front of their roosting place is all that is needed to keep them comfortable. In the day time they should keep warm enough scratching in straw or other litter for a portion of their rations.

4. LIGHTING. In locations where wire netting is used for the front of the hen-house, the matter of lighting the interior requires no further consideration. It is advantageous, however, to place open front houses under apple trees or other trees that shed their leaves in autumn, but provide ample foliage for shade in summer.

In northern latitudes hen-houses facing southerly are usually lighted by windows in front but may well have some lighting on the east and west so as to catch the rays of the rising and setting sun for the comfort of the

fowls. These window spaces, opened wide in summer, help to keep the interior of the house cool when the weather is hot.

If glass is to be used in the front of the house the window space need not be large. For a house having pens each with a frontage of ten to fifteen feet, one window of two sashes, each sash of six lights of glass ten by fourteen inches or thereabouts will suffice. Too much glass surface is to be avoided, because glass is an excellent conductor of heat. It lets in the warmth of the sun's rays at noonday, but also lets out the warmth at night, so that a house with its front entirely of glass sashes is much like a hot-bed at midday and a cold storage room at night.

5. VERMIN. Poultry houses should be built so that lice, mites and all other insect pests may be kept out or if they enter may be easily destroyed.

Cracks, crannies and crevices should be avoided so far as possible.

Smooth, hard, interior walls give a surface that will not harbor the pests and if they get upon it they are readily destroyed by spraying with insecticide. Walls of plaster are excellent on this account.

6. RODENTS, The buildings should be made rat proof, which will secure them against other animal enemies, such as skunks, weasels, etc.

One plan is to make the floor of concrete, using one part Portland or other good hydraulic cement to five parts of sharp sand and gravel. These ingredients should be mixed dry very completely, then with water be made into a mortar, thin enough to flow slowly and thick enough to stay in place until it solidifies.

A smoothened, firm layer of coarse gravel makes a good foundation for the concrete floor. On this is poured three to four inches depth of the mortar which is smoothed off and allowed to set without being touched for at least twenty-four hours. The surface is shaped or graded to the level desired for the floor when the mortar is applied. It may be well to make the floor at the

center of the house or apartment a little higher than towards the sills, grading the surface evenly so that it will shed water towards the outside of the building.

After the concrete is set it may have a surface coating of nearly clear cement mixed with water, to give it a smooth hard finish.

Another plan for outwitting the rats is to underlay a board or dirt floor with wire netting of fine mesh or the netting may be placed around the outside of the house, extending from the sills vertically down eighteen inches into the ground, then turning horizontally extend six inches in the ground away from the house.

7. INTERIORS. The arrangement of the inside of a hen house, incubator cellar, brooder house or other poultry building should be the simplest possible.

The so-called fixtures, even the partitions, should be removable.

Inside doors or gates may be hung on double hinges to swing both ways or special springs may be attached to keep the doors from being left ajar when they should be shut.

Every precaution should be taken to avoid placing doors, nests, feed-hoppers, etc., where they will cause the attendant to take extra and useless steps in caring for the fowls.

Communication between rooms or pens in a large house should be direct, not roundabout.

The entrance and exit doors of each house should be so placed that the poultryman may get into and out of the house with the greatest convenience and economy of steps.

CONSTRUCTION MATERIALS.

The poultryman should make a special study of the available building materials of his locality. Lumber, even at prevailing high prices, is the material best adapted, in most cases, for making poultry buildings, especially if they are to be portable or removable.

In frontier localities, where forests abound, satisfactory hen-houses may even be made of logs.

Building paper is much used for covering roofs and sides of poultry structures. Some kinds require frequent coating with tar paint.

Glass windows are mainly employed for lighting, but expense may often be reduced by using cotton cloth or wire netting as substitutes.

Iron hinges, latches, springs, catches, locks, screws and nails have their places in construction.

Concrete (hydraulic cement, sand, and water mixed to a mortar) is often used for making floors and may replace brick, stone or timber in building other parts of the houses.

Straw thatch makes a very comfortable house for fowls, being warm in winter, cool in summer, self ventilating, economical and capable of being made attractive in appearance.

Adobe and turf hen-houses are built in some localities and answer the purpose.

In sections where straw is abundant and cheap it may be used to thickly cover the back, ends and roof of a framework made of poles which has a front of wire netting, cotton cloth or boarding and glass windows.

SCRATCHING SHED HOUSE.

Size ten feet by eighteen feet; front wall seven and one-half feet; rear wall four and one-half feet. Material—frame two by four inch siding, matched lumber, battened or covered with roofing paper.

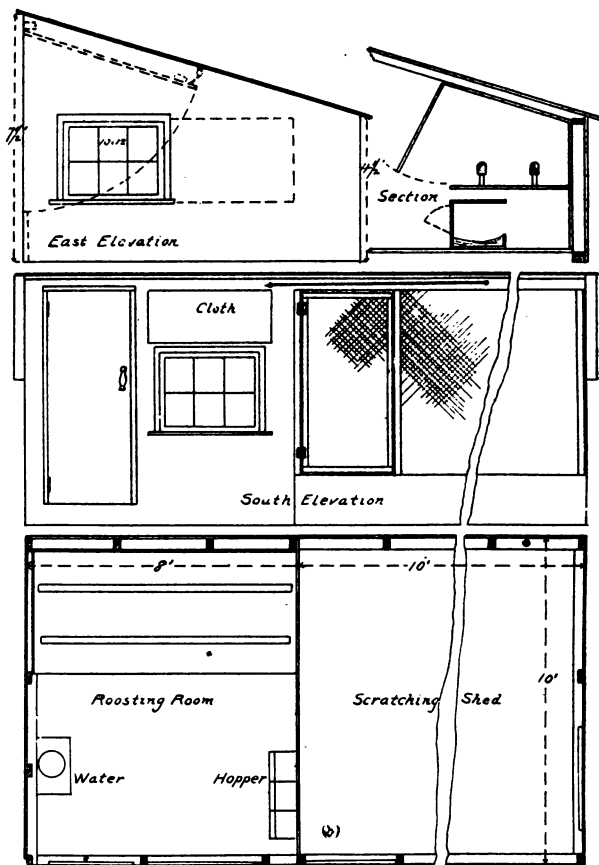
Roosting room to be floored with boards or cement. Scratching shed has a dirt floor.

Roosting room to be ceiled up behind and above roosts. Cloth covered frame to be hinged above roosts and swing down in front of them for use on very cold nights.

Cloth covered opening may be left above window for ventilation, or if preferred this cloth can be placed in partition between roosting room and scratching shed. Door may be placed in same partition if desired.

Front of scratching shed is boarded up eighteen

inches above sill and poultry wire netting used above. Door should be placed in front of scratching shed for convenience in cleaning out, etc. Cloth covered frame



SCRATCHING SHED HOUSE.

of sufficient size to close up entire open front of scratching shed should be hinged to the plate. This may be swung up against the roof in good weather. A light

weight rope may be attached to the center of the lower edge of the frame and passed through a pulley secured to the roof as indicated by the dotted lines in the "east elevation," thence out through an opening in the front of the scratching shed. By pulling this rope the cloth covered frame can be raised to any desired height and retained in that position by securing the rope to some convenient hook or ring. It may be found advisable to secure a brick or two to the lower edge of the frame in order to cause it to swing down in place when the rope is released.

If convenient the east end of the building should be used as the scratching shed. A single-sash window placed in the end as indicated in the drawing will receive the morning sun and will also afford plenty of light to permit the birds to enjoy the scratching shed when the weather is so bad that the curtain must of necessity be closed.

PLANNING THE BUILDINGS.

If all poultrymen, all locations, all poultry and all environing conditions were alike it might be worth while to attempt the planning of the best hen-house and then all copy it.

Since these items are always different each case becomes a separate and special problem calling for personal solution by the poultryman concerned. Copies are often misfits.

An adapted, attractive, economical structure, convenient, comfortable and completely finished and furnished will be proof positive of the excellence of the poultryman's brainwork and express in the concrete his individual idea of the fitness of things.

Every poultry building should be planned to fulfil its definite purpose, be suited to its situation and harmonize with its surroundings.

Having sufficiently studied the subject it is well for the poultryman to take paper, pencil and ruler and either himself or by proxy, draw a plan to a scale, of the proposed structure. Mistakes made on paper are more

readily corrected than errors occurring in actual construction.

If buildings for a large plant are to be erected, plans for all of them should be drawn so that the work of construction may go on correctly and systematically.

If the poultryman is particular about preserving the plans, use may be made of tracing paper and ink. Blue prints may then be easily obtained for reference during the constructing of the buildings.

In planning houses to be occupied by fowls it is well to allow at least four square feet of floor space or twenty-four cubic feet of air space per fowl.

SPECIFICATIONS AND ESTIMATES.

If the houses are to be built by contract it is necessary, and in any case it is desirable, to draw up detailed specifications of construction and make a list of the required materials.

These items may then be considered by a builder and an estimate easily made of the cost of materials and of the labor for constructing the buildings.

Several bids on estimates may be obtained and compared before contracting for the construction.

If the poultryman is his own carpenter he may simply get estimates from lumber dealers and hardware stores of the cost of materials.

CONSTRUCTING THE BUILDINGS.

The poultryman who can construct his own hen-houses may save the investment of considerable money. Even if he only assists in the construction work it will be an advantage because he will see that the work is not neglected and may prevent the occurrence of costly mistakes.

FURNISHING THE HOUSES.

The furnishing of the poultry buildings should be made with the idea of expediting and saving work in operating the plant.

HEADQUARTERS.

A good office desk and several chairs, perhaps a table and possibly a typewriter will equip the manager's office nicely.

If the building contains sleeping rooms for the poultryman or assistants these are furnished with beds, chairs, wash-stands etc. according to their requirements.

FEED HOUSE AND WORK SHOP.

Bins for holding supplies of feeds may be made of hemlock planks or if made of other wood may be lined with galvanized iron and provided with covers so that rats and mice shall not take toll. If these storage bins are placed in the upper story, metal or wooden shutters may be made to conduct the feed stuffs from bins to feed room as this saves labor. Tight strong barrels, fitted with close covers will answer for the storage of feed stuffs for a small flock of fowls.

In the feed room an iron or wooden trough will be handy for use in mixing dry feeds for the hoppers or wet mashies if these are fed to the fowls.

A set boiler will be useful for heating water, boiling vegetables, etc.

Buckets, shovels, etc., should be at hand and each have a place of its own, in which to keep it when not in actual use.

The work room may have a complete outfit of carpenter tools and a cabinet in which to keep them.

Benches, vices and other appliances for use in working wood and iron will be provided according to the purpose of the poultryman.

A tool-room may well be set apart in this building and furnished with shovels, hoes, rakes, hand or horse cultivator and any other implements desired for use in caring for the poultry plant.

INCUBATOR CELLAR. The furnishings for the room or house to be devoted to artificial hatching will include an outfit of incubators, an egg tester, a table and a chair. The tank for oil to supply the incubator lamps should

be kept outside of the incubating apartment for safety. One or more thermometers may be hung on the walls. An hygrometer may be kept on hand for determining the humidity of the air in the room.

For protection against danger of fire a series of iron pipes may be placed near the ceiling, connected with the main water supply and provided with automatic fire extinguisher heads, one over each incubator lamp.

SITTING HOUSE. If natural hatching is followed the sitting hens should have a house or room by themselves provided with nests, water-fount, feed-hopper and dusting place.

The nests may be made upon a dirt floor and over each a bottomless box be placed which has a slatted door for use in confining the hen upon the nest when necessary.

BROODER HOUSE. The chief furnishing of a brooder house is a good heating apparatus, so that the temperature of the interior may be absolutely under control. A coal bin should be made for holding the supply of fuel.

If a cold house is used then brooders heated by lamps may be provided.

Thermometers should be supplied. Water fountains, feed-hoppers and grit-boxes are to be furnished in sufficient numbers.

HEN HOUSES. Each house or apartment devoted to the sheltering of the fowls will require to be furnished with perches and may have a platform placed beneath the perches. These and all other furnishings should be made removable. Scantlings two by three inches, laid wide side down and upper edges rounded, make excellent perches.

Nests are easily provided by using empty orange boxes or egg-crates.

Feed hoppers of metal or wood may be hung against the wall of the room.

Wasting of food by the hens is prevented by facing the feed-boxes with wire screening.

Water fountains should be raised above the floor sufficiently to prevent the liquid becoming fouled by litter or dirt flung about by the scratching of the fowls.

A cockerel cage may be hung in a room or pen where fowls are kept. It will be of use in confining a surplus male bird or curing a hen of broodiness.

A frame or curtain of burlap or cotton cloth for use in front of the roosting place is provided, if special protection from freezing is required.

RANGES AND RUNS.

Houses are for fowls to stay in only when they are not better off out of doors.

Any plan which gives the fowls the freedom of the fields is excellent, provided they are safe from enemies, cannot get to decomposing dead animals, or other dangerous diet and do not trespass in places where they are not wanted.

If free range on the farm includes grass land, tillage and woodland or orchard the conditions are especially favorable for the fowls. Under such conditions the birds, for the most part, take care of themselves, obtain much of their sustenance from natural sources and, in their efforts to get food, take exercise which tends to keep them healthy, hardy and full of vigor.

PARKS.

To permit of free ranging in mild weather, and yet prevent the fowls roaming where their presence would be objectionable, a large area may be enclosed by fencing, thus forming a park.

Within such an enclosure there is practically no restraint, since the birds wander as widely as they care to.

If shelter is required in a park it is readily provided by constructing simple thatched or rustic structures in secluded spots or erecting small houses to harmonize with their surroundings.

POULTRY YARDS.

The word yard comes from an Anglo-Saxon word

which means a hedge and hence an enclosed area usually of small size and adjacent to a building.

Domestic fowl adapt themselves to the conditions in which they find themselves and often thrive wonderfully well under circumstances that are not usually considered altogether favorable.

When the birds are very much confined they require more attention from the poultryman.

To save this extra work and care is advisable. Therefore, where practicable, the enclosure should include as many as possible of the naturally favorable conditions of free range or substitutes for the same.

SIZE OF YARD. If abundant space is available and the expense of fencing is not excessive the yard may well approach the size of a poultry park.

If, however, the area at disposal is restricted, the yard room may be diminished accordingly.

The Asiatic breeds of poultry will submit to smallness of space more readily than the American varieties. The Mediterraneans, especially the lively Leghorns, require large yards if they are to be kept from becoming discontented.

Close confinement tends to either uneasiness or moping, both of which conditions are unfavorable to the successful keeping of fowls. Overcrowding the yard tends to conditions of unhealthfulness.

To keep the yards clean and healthful there is nothing better than frequent stirring of the soil.

Fresh turned loam has great powers of absorption and will promptly deodorize the droppings that are covered by it.

Raking and spading by hand or cultivating by horse power will make a yard very fresh and clean.

If the ground is kept mellow the fowls will usually do much of the necessary stirring of the soil by scratching.

Scattering straw, hay, or leaves in the yard and throwing small grains into it will give the birds an

incentive to exercise and help to prevent their becoming sluggish, even when kept in small enclosures.

The smaller the flock the larger should be the ground space per head, since each fowl has the run of the whole yard, be it small or large.

One hundred to two hundred square feet of ground may well be allowed per fowl when kept in flocks of fifty.

SITUATION AND SHAPE OF YARDS. The poultryman may be obliged to locate and shape his hen-yards according to boundary or division lines already fixed.

Use should be made of established fences if they are suitable for keeping the fowls enclosed.

If the poultryman has his choice as to shape of yards he should bear in mind the fact that a square area calls for the least length for fencing of any shape bounded by straight lines.

If yards are to be provided for a row of houses or a series of pens in a long house they may be of quadrilateral form and contiguous.

The prevailing winds of the cold season should be considered and the yard located to the leeward of the hen-house if practicable.

The yards should not extend in front of the entrance and exit doors of the hen houses or be placed so that the attendant must pass through the yards to get to and from the houses.

ARRANGEMENT OF YARDS. It is well to divide the yard space available for each flock into two or three enclosures, alternating their use between the fowls and the growing of crops for their food.

One plan is to place a double or triple yard in front of the house, the enclosures being of equal size and extending away from the house, side by side.

Another plan is to have two yards in front of the house and beyond these a third yard, kept preferably for grass, clover or alfalfa.

An arrangement for northern latitudes that allows for changing the runs according to the season is to locate

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one yard to the south of the house and another to the north.

In arranging the yards the matter of their future cultivation should be kept in mind.

PIANO BOX POULTRY HOUSES.

These drawings are based upon piano boxes of the following dimensions: Height four feet, six inches; length five feet, ten inches; width at top twenty-two inches; width at bottom thirty-two inches.

Figure 1 shows the plan of construction of a six feet by eight feet poultry house, made from two piano boxes of the above size. The first step is to secure floor timbers which should be laid as indicated in the drawing. The boxes with the backs and tops removed should then be set in position (leaving approximately the width of one box between them), and securely nailed to the floor timbers. The floor should then be completed by filling the vacant space with some of the boards which have previously been removed from the tops and backs of the boxes. The next step is to nail in the rest of the frame as indicated by the solid lines in the drawing. One inch by two inch strips serve this purpose admirably. When nailed as indicated in the drawing they stiffen the whole structure so that it can be moved without being badly racked.

After this frame is completed the ends can be boarded up, leaving the necessary openings for door, window, ventilator, etc.

Finally the roof should be completed. The pitch in the center of the roof (note figure 2, elevation) is most easily secured as follows: Ten inch or twelve inch boards of sufficient length to reach from shoulder to shoulder of the boxes, sawed as indicated, and attached at each end of the structure. Upon these boards the roof boards are nailed. The whole structure should then be covered with some good roofing paper.

In figure 2 is indicated the cloth covered opening for ventilation.

Figure 3 shows on a reduced scale an eight feet by twelve feet scratching shed house made of four piano boxes. For convenience in handling this should

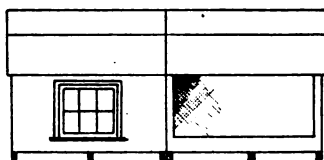


Fig. 3.

Scale — 1 ft

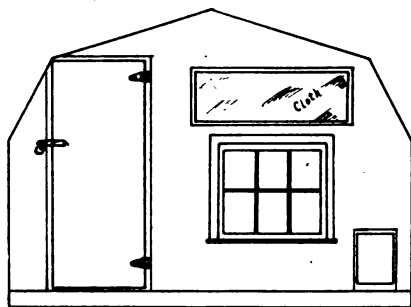


Fig. 2

Scale — 1 ft

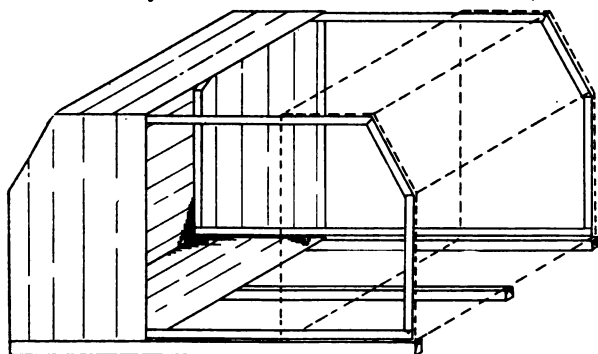


Fig. 1.

PIANO BOX POULTRY HOUSE.

be built in the form of two six feet by eight feet structures and after completion the two are set together in

position as indicated. In the spring when the breeding stock no longer requires quarters in addition to the roosting room, the scratching shed may be used to advantage as a brooder house or colony house.

Each of the two parts should have a full sized door in one end.

In addition to the extra lumber secured from the tops and backs of the boxes, a small amount may be required to finish the structure and its interior fittings.

FENCING.

MATERIALS. Fences for poultry yards may be made of pickets, laths or narrow strips of boards, nailed upon a frame of scantling.

If the strips are placed obliquely rather than vertically, upon the horizontal bars and a second layer of strips nailed over the first at any desired angle, an attractive lattice is formed. By running vines over the lattice work its appearance may be further improved.

Common wire poultry netting, one inch mesh for chicks, two inch mesh for bantams, and two or three inch mesh for the larger breeds of fowl, is very commonly employed for making fences. This material is difficult to stretch straight and to keep from bulging or warping, after it is in place. The posts for such fencing require to be placed rather near together. Eight to ten feet apart will answer.

Boards are often used for the base of such a fence, especially where it divides adjoining yards containing male birds that are inclined to quarrel. If they try to fight through wire netting they are very likely to mutilate their combs or wattles on the fine wires. Netting of one inch mesh may be used for the lower two feet of the fence if it is more convenient or economical than boarding.

Woven wire fencing made with the meshes small at the lower part and increasing in size towards the top is extensively used. It requires fewer posts than the poul-

try netting. Usually it is safe to place the posts a rod (sixteen and one-half feet) apart.

Posts for permanent fences may be of cedar, oak, chestnut, catalpa or any wood that is tough and durable.

Iron piping or concrete shafts may be employed for posts in locations where suitable timber is either very scarce or excessively costly.

ERECTING WIRE FENCES. Manufacturers of standard woven wire fencing usually supply printed directions for putting up the fences, but a few points may be mentioned that are particularly pertinent.

Wasting of the posts, if they are of timber, or even of iron, occurs principally at the surface of the ground where alternate wetting and drying promote decay of the wood or rusting of the metal.

This part of the wooden post may be rendered less liable to weakening by charring with fire, coating with hot tar or saturating with a solution of copperas. Iron posts may be coated with tar or water-proof paint.

Wooden posts for the corner of the fence may be eight or ten inches in diameter. Intervening posts need not exceed six inches in diameter, especially if the fence is to be erected in a straight line.

The corner posts should be set at least four feet in the ground and braced by poles extending from near their tops to the ground at the next post in line. The intermediate posts may be set three feet in the ground.

A post-hole digger is most useful in excavating the holes unless the ground is exceedingly solid or stony. A long-handled, round-pointed shovel and an iron bar are also useful tools.

A special fence stretcher, obtainable of the dealer in woven fences, will be a great help in drawing the fencing into place.

Galvanized wire staples are used to fasten the wires to the posts.

The fencing comes in rolls of different widths and thus determines the height of the fence. For fowls of

the heavy breeds, if accustomed to being yarded, a height of three feet will suffice.

More active birds, unless they have been on free range previously, will stay within yards fenced five feet high.

If fowls fly over fencing six feet high, it may be best to confine them in covered runs.

The posts being in position and the soil solidly tamped around them the end of a roll of fencing is attached to an end post and the woven wire unrolled along the line of posts. Two workmen are sufficient for the task of stretching and stapling the fence.

The stretcher or a lever is used to draw the fencing taut and it is fastened by the main horizontal wires to the successive posts.

The lower edge of the fencing should follow the grade of the ground.

Sometimes it is desired to erect a temporary wire fence. In such case posts may be used that are not over four inches in diameter. These are sharpened at one end and driven like stakes into the ground. The woven wire is stretched and attached to the posts by staples as in the case of the permanent fence.

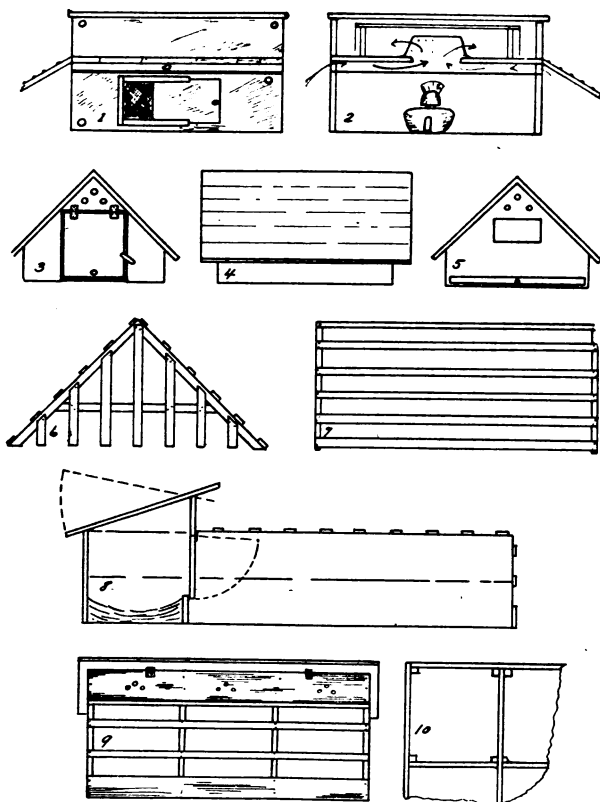
In removing the fence, the staples are first drawn, then the woven wire is rolled up and the posts are pulled out. These materials are stored in safety for future use.

APPLIANCES FOR HATCHING AND REARING CHICKS.

Figure 1 is elevation and figure 2 is section of home made brooder.

This brooder has been used for years very successfully by one of the largest commercial poultrymen of Connecticut. It is built as follows: The box for the lamp is three feet square and ten inches in depth. Upon this is nailed a galvanized iron top, covering the entire box. Above this latter, around the four sides are nailed strips one inch in thickness and upon these is nailed the floor of the brooder. The inch strip mentioned above should have a one inch hole cut out on each side. This

admits air between the galvanized iron and the floor of the brooder which is warmed without any admixture of lamp fumes by the lamp underneath the sheet of galvanized iron. This warm air then passes up through an



APPLIANCES FOR HATCHING AND REARING CHICKS.

opening in the floor into the drum and thence out into the hover.

The hole mentioned above is in the center of the floor and is eight inches in diameter. Over this is tacked

deep. The sides of this pan should be punched full of nail holes, the punching being done in such a manner that the rough edges of the tin will project into the pan. It is through these openings that the warm air passes out under the hover.

The hover should be made of thin matched lumber two and one-half feet square resting upon legs four and one-half to five inches in height. Around the entire edge should be tacked a felt curtain slashed at frequent intervals from top to bottom.

The hover chamber may be formed of six inch boards nailed together and set on the floor of the brooder. If the weather is cold or the brooder is placed in an exposed position, a window sash may be laid upon the top to retain the heat in the hover chamber.

After the chicks have reached an age when they may be permitted to run on the floor of the brooder house, one of the six inch boards forming the sides of the hover chamber may be removed, thus letting the chicks go in and out at will.

If the builder so desires he can make the side of the hover chamber permanent, inserting glass and a door, and hinge a tight cover on the top.

Sufficient ventilation both for the lamp chamber and hover chamber must be provided.

This brooder is intended solely for indoor use. It is simple to construct, inexpensive, and has given excellent satisfaction upon many practical farms.

Figure 3 represents floor elevation, figure 4 side elevation, figure 5 rear elevation of a brood coop.

This is twenty-four inches by thirty inches in size, and twenty inches in height at the peak. The side walls are six inches in height. If carefully built of matched lumber such a coop will last for years and give excellent satisfaction. The front is equipped with a good sized door and the rear has a small pane of glass inserted. The floor is arranged so that it may be pulled out at the rear of the coop for convenience in cleaning. It slides upon cleats tacked to the side walls. Ventila-

tion is provided by holes bored through each end as indicated in the drawing.

Figure 6 represents the end elevation, and figure 7 the side elevation of a lath run to be used in conjunction with the above described coop. This is twenty-two inches in height, forty-four inches in width, and forty-eight inches in length. The open end should be set against the front of the coop. When the door of the latter is fastened open the hen has the advantage of this run where she can better care for the chicks than if confined entirely to the small coop. Pieces of board may be leaned against the side of run or old bags thrown upon it to furnish shade when needed.

Figure 8 shows section, figure 9 elevation, figure 10 plan of set of nests and runs for sitting hens. This is made four feet by six feet in size, the runs being sixteen inches in height, and the nests twenty-two inches at the front and sixteen inches at the rear. Every nest is approximately sixteen inches square and the arrangement gives each hen a nest of this size and a run that is approximately sixteen inches in width and four and one-half feet in length. The front of each nest is equipped with a door hinged at the top. After the hens have become accustomed to the quarters these doors may ordinarily be left open and the hen permitted to exercise or remain upon the nest as she sees fit. Food and water should be supplied daily. The roof of the nests should be hinged in front and swung upwards to permit the attendant to care for the birds. Such an arrangement being almost automatic, can be used to excellent advantage upon a farm where many birds are set each year, as it greatly reduces the task of caring for them.

GATES.

Each yard should have gates sufficient for easy entrance or exit and so placed as to be convenient.

For the wire fences, gates are manufactured having a frame work of iron rods covered with woven wire,

similar to the fencing. A frame may be made of iron water-piping and covered with wire netting or woven fencing.

Common gates made of lumber and covered with poultry netting will answer if they are well braced to prevent sagging.

All gates should be hung to firm, well set posts by strong hinges and be provided with latches and hooks for fastening in place, either open or shut.

SHADE FOR YARDS. Trees furnish the best of shade for poultry yards.

Fruit trees answer the purpose nicely. Deciduous trees provide shade in summer, and, dropping their leaves for winter, permit the sunshine to strike past their limbs in cold weather.

Evergreen trees planted in hedges for wind-breaks for winter also furnish a dense and cooling shade in hot weather.

Artificial appliances for providing shaded spots in the yards include covers made of the branches of trees cut in full foliage, frames of burlap, sacking or cotton cloth, shutters made of slats, frames of wire netting or laths covered with straw or hay, etc.

CULTIVATION AND CROPPING. Crops for shade, shelter or food may be grown in the yards if the arrangement of double or triple enclosures is adopted. Indian corn, sunflowers, castor bean, all provide a generous shade when they have attained considerable growth.

One of the yards may be devoted permanently to asparagus, raspberries, blackberries or grapes and the fowls allowed in it when they will be benefitted and cause no injury to the crops.

It is well to keep at least a portion of the yard space in grass or growing grain to provide green food for the flock.

In the double yard plan one of the enclosures is plowed early in spring and oats are sown. After the grain is six inches high the fowls are turned upon it.

The other yard is plowed or harrowed and sown to oats or millet.

When the crop in the second yard is ready for the fowls, the first yard is again cultivated and sown with millet.

In early autumn the second yard is plowed or harrowed and sown to barley.

Later the first yard is plowed and sown to rye or winter wheat.

In localities where alfalfa, cow peas and soy beans can be grown, they make excellent crops for feeding to fowls.

If the triple-yard plan is followed one of the enclosures may be used throughout the season for producing crops of cabbage or mangolds, to be used as green food in the winter time. This yard is used for the fowls to run in the next year.

By systematic rotation in cropping the yards they are kept in cleanly, healthful, inviting condition and at the same time valuable crops are secured for the fowls or their keeper.



Pioneer Log House in Black Hills, So. Dakota. Used as a School House, as a Dwelling, and now a Hen House

CHAPTER X

Exhibiting, Scoring, Judging

I. EXHIBITING.

One of the most fascinating and popular lines of poultry culture is that of breeding, growing and exhibiting pure bred or fancy fowls.

The poultry fancier, although his flock, oftentimes, may be small, is usually intensely interested in progressive poultry keeping. He seeks to produce the best in quality according to the standard which he has set before him.

Naturally, if successful, he takes pride in the results of his efforts and desires to know how his best birds compare with those of other fanciers.

The poultry show is a convenient and suitable place for deciding the relative standing of the birds according to the standard for each variety.

The poultry show also offers opportunity for determining the defects of the birds by experts.

Here, too, the fancier may study the particular points of birds of different strains or families of his chosen variety.

If the fancier exhibits superior stock, and especially if the birds win important prizes, the process proves to be an excellent means of advertisement. Even if the prizes received only partially cover the expenses of exhibiting, the resultant sales of stock and eggs often bring very satisfactory pecuniary profit.

Poultry exhibitions have become very popular and attract multitudes of people who admire beautiful fowls. Many patrons of the shows become purchasers of pure-

bred stock or eggs for hatching from exhibitors whose birds prove prize-winners or please their fancy.

THE EXHIBITOR'S EDUCATING.

In preparing for successful exhibiting of his fowls, the fancier may well subject himself to a systematic training.

If he intends to take a thorough course, his text-book will be the Standard of Perfection; if a short course only, he may use the standard of his selected variety of fowl. He studies the points of perfection, learns the disqualifications and defects relative to his breed of birds, informs himself as to the technical terms employed, and begins promptly to apply the knowledge gained.

His fowls become original and effective object lessons, deserving of much careful study. His own hen-house makes an ideal poultry laboratory for research and practice, where he can learn at first hand.

He will do well to join a class of fellow fanciers by securing membership in the specialty club which is devoted to the advancement of his chosen breed or variety of poultry.

He should also join the local poultry club, or aid in forming and maintaining such an association for the purposes of exhibiting fowls, holding meetings for the discussion of poultry subjects, securing lectures by poultry experts and advancing poultry culture in every practicable way.

He will doubtless find opportunity awaiting him to help as volunteer, assistant or officer in the management of the local poultry show.

This experience will give him a liberal education in the exhibition branch of poultry culture.

Acting as assistant to a poultry judge in scoring the birds or deciding the awards of prizes will give him an intimate knowledge of the inside workings of the undertaking.

He will find further opportunity to learn in conver-

sations and conferences with poultry specialists, who are usually very ready to impart information to the interested poultryman.

Much valuable information is also obtained from the best poultry books and periodicals and from federal and state reports and bulletins treating of pure-bred fowls and the keeping of poultry.

Thus by self-directed, earnest study, by personal management of his flocks and by association work, the fancier becomes educated, experienced and expert in his line of poultry culture.

Not the least encouraging feature of this plan is that, while learning himself, the fancier is also helping to teach others and is aiding in the advancement of the poultry calling.

FORE-WORK FOR THE FANCIER.

The foundation for success with exhibition fowls is well laid when the fancier selects the best possible stock and correctly mates the birds according to the steadfast principles and sensible practices of breeding.

The proper feeding and management of the stock, the scrupulous care of the fertile eggs and their skillful incubating all have large influence upon the final results in the show-room.

After the chicks are well hatched they must have due attention to keep them growing thriftily and steadily developing their good qualities.

Some exhibitors prefer the natural method of hatching and brooding while others trust to incubators and machine mothers.

Full instructions in these matters have been given in previous chapters. Whatever the method pursued it is careful, interested, personal attention to details that determines the results.

The secret of success, if secret it may be termed, is to make each and every condition of shelter, feeding, exercise and control ever helping and never hindering

to healthy development of the chicks. Steady, even, continuous growth is thus insured.

Forcing of growth is undesirable. Ample time should be allowed for the full development and gradual growth to natural size of the blood-vessels, nerves, bones, sinews, muscles, lungs, digestive system, generative organs and of all other parts of the body.

The surface appearance or outward beauty of the bird is the chief thing when it comes to the show-room, but healthfulness, thrifty growth, good digestive power, vigor, stamina all help to develop the beautiful plumage and attractive appendages of the prize-winner.

Sprightliness and symmetry assort well together.

Culling may commence early, certainly by the time the chicks are two months old. At this time, or as soon as possible, the chicks should be separated according to sex and thereafter be kept in different colonies.

It is not difficult to pick out any chicks that have crooked spine or breast bone, uneven hips, missing rump, wry tail, crossed beak, blindness or other deformity, and those that are stunted, or that show decidedly defective feathering.

When the combs and wattles are sufficiently developed these should be closely scrutinized and any chicks showing incurable defects in these parts are removed from the flock. Young fowls need not be discarded for failure to show correct feathering while growing because their first feathers will be shed and new plumage take their place before show-time arrives. For instance, chicks of some white varieties may show grayish or smutty surface color when hatched and while growing, but put on a pure white plumage as adult fowls.

The culled chicks may be used for the table, marketed as broilers, or otherwise disposed of, especially if all the room available is needed for the chicks that remain. The fancier who has only a limited area for raising chickens, following this method, may hatch a large number to choose from. By culling early and

severely and disposing of the culls he avoids crowding the choice chicks. The poultryman who has abundant room may prefer to raise the chicks rejected for standard defects, but otherwise good, to larger size.

Sorting and selecting of the choice chicks is continued until only the exceptionally excellent birds remain. These are marked by means of leg bands and individually studied by the fancier until he knows each one's points fully.

The intending exhibitor should decide what show or shows he will patronize at least six or eight weeks before they occur. He should ascertain if possible who is to judge the birds of his class. According to the conditions he selects a number of his birds to choose from, for the coming show. If the birds have not fully molted their chick feathers, some linseed meal or hemp seed in the daily ration will help the growth of the new feathers. Even after the adult feathering is complete a little linseed meal daily will be beneficial as it helps to keep the bowels in good order and tends to smoothness and glossiness of the plumage.

Chickens of the different breed groups mature at varying ages. The Mediterraneans are fairly well matured at six to seven months; the American varieties require about eight months and the Asiatics, on the average, ten months to reach the adult stage of growth.

Inspection of the plumage for defects of color and condition is now in order. If any of the birds show characteristics disqualifying them according to the standard and not possible of correction, they are discarded. Any stubs, injured quills, or feathers having discolored webs are to be removed so that new feathers may replace them.

Lice, mites and all other insect enemies must be banished. Intestinal enemies can not be harbored if the birds are to be kept in health and good condition. Particular watchfulness should be exercised to keep the surroundings healthful and prevent sickness among the handsome fowls.

The enthusiastic amateur should avoid over-doing things. Coddling the fowls is quite certain to cause softening or weakening of the constitution. Confinement of the cockerels in quarters excessively warm is likely to induce rapid growth of their combs. In case of single combs which should stand erect there is lopping or falling over. Too much meat in the rations may have a like effect.

Pullets of the Mediterranean class, such as the Leg-horns, whose combs are expected to become as large as those of cockerels and to fold over the top of the head, may need some meat to stimulate comb growth but too much animal food will tend to cause early production of eggs. If permitted to lay there will be halting of body growth, reduction of weight and lessening of the glossiness of the plumage.

A pullet just ready to lay is in the pink of condition for exhibiting. If she attains this condition before the poultry show occurs, egg production may usually be postponed by removing her to new quarters, which, if necessary, may be made cooler and darker than her previous shelter.

Weighing of the birds at regular intervals for several weeks before show-time will give a very exact knowledge of their condition, their increase in size and approach to standard weight, in the case of breeds having a standard weight requirement.

FITTING FOWL FOR THE SHOW.

During the two weeks preceding exhibition the birds should be trained and fitted for showing.

A comfortable properly ventilated pen or room should be provided where the fowls can at any time be easily caught and yet not be crowded. A layer of fine clean, dry sand is placed on the floor and over this a foot depth of bright, clean straw is strewn.

Males and females are kept in separate pens and only fowls well acquainted with each other are put to-

gether. This is to avoid danger of injury from abuse and quarreling.

The birds will be exhibited singly, each in a separate coop, at the show, unless the fancier chooses to enter his fowls as an "exhibition pen" of one male and four females.

A training coop, similar to an exhibition coop, should be placed in the fowls' apartment about three feet above the floor. In this cage each bird may be daily trained in preparation for the show.

In the choice of birds the exhibitor first sees that they are free from disqualifications and next seeks to select such as have shape as near to the standard as possible, being guided by the standard descriptions and illustrations. He looks to the head, especially the beak, comb and eyes and does not neglect the wattles or earlobes.

The color or markings of the plumage, both surface and subsurface, are exceedingly important.

A bird having any glaring defect is to be rejected in favor of one having several minor defects.

The description of the standard should be taken literally as it stands.

In breeds of white plumage, brassiness, yellow color and even straw color or creaminess are blemishes.

In black colored breeds bronze or purple barring is undesirable. A dull somber black is passable but a metallic greenish black is preferred.

Fresh water, grit and granulated charcoal are kept in hoppers before the fowls and they are fed their regular rations. Some of the grain is scattered in the loose straw to induce scratching for the sake of body exercise and consequent good circulation of the blood.

Birds that are below standard weight may be brought up by feeds of fresh, finely cut meat and warm mash. Gentle handling of the fowls frequently makes them tame and submissive to training so that they are not easily frightened during exhibition time.

A bird placed in the training coop is taught to stand

up and by proper posing to show off his fine shape to advantage. The trainer may use a light stick about one-half inch in diameter and two feet in length to touch up the bird and make him pose correctly. After a few lessons he should pose promptly on the approach of the trainer or any other person.

If a comb or wattle is not quite correct it may often be worked into proper shape by daily manipulating with the thumb and fingers. Slightly defective wings and tails may be improved in like manner.

If the exhibitor knows what feed is to be given the fowls at the show he may use such feed for their rations during two or three days previous to showing and thus accustom them to exhibition diet.

The birds should be clean when they go to the show. The combs, wattles, ear-lobes, shanks and toes should be sponged with warm water and soap that is not harsh.

If dirt has collected under the leg and toe-scales it is readily removed after sponging or soaking by the use of a wooden tooth-pick.

The parts cleaned by sponging with warm soapy water should be again sponged with clean cold water and may later be gently rubbed with vaseline then wiped with a soft, dry cloth. This treatment may be repeated at the show if necessary.

Birds of white plumage may require washing to make their appearance attractive.

Place the bird in a tub or large bucket filled with warm water which has been brought to a lather by using white wool soap or a soap containing no resin or harsh alkali. The bird is immersed except the head and the soapy lather worked through the feathers to the skin. Next place the bird in a tub of clear lukewarm water and sponge out the dirty soapy water thoroughly. Do not rub against the grain of the feathers. Finally place the specimen in a tub of clear, cool water to which may be added a little laundry blueing to help remove any yellowishness of the plumage. Thorough rinsing is followed by removal of the bird to a com-

fortable place where he can shake himself free of excess of water. Then with a dry towel most of the moisture is absorbed from the feathers. The bird is placed in a coop fronting an open fire, over a warm register or in any suitable comfortable, warm place to completely dry out.

If the bathing has been properly done the plumage becomes bright, fluffy and very white, giving the bird a most attractive appearance.

To help keep the plumage white and clean, fine, dry, laundry starch may be sifted among the feathers.

SHIPPING TO THE SHOW.

Exhibition fowl are usually forwarded to the show by rail in charge of an express company. The journey may include a drive in an open wagon, a wait upon an exposed rail-road platform, a ride in a hot box car, storage for a while in a closed express office or in a wind swept shed, another wagon trip and perhaps a delay at the door of the show room and all under vicissitudes of weather which may not be fore-told.

Light, strong shipping coops are now manufactured which are well suited to the purpose. If the poultryman must furnish exhibition coops for his fowls at the show he may ship them in combination shipping and exhibition coops. These are also manufactured in quantities and sold by poultry supply houses.

In either case or in any case it is well to cover the top, back and sides with cloth and provide a curtain for the front of the coop. Strong canvas cloth is best for this purpose but common cotton cloth can be used. During the shipment the curtain in front is closely fastened down. The cloth protects the birds from winds, yet admits plenty of fresh air. If the top of the coop is made of thin boards the birds, during transportation, will be comparatively safe also from rain or snow.

If convenient the shipper may well take the same train to the show that carries his coops of exhibition fowls. He can then see how his birds fare before and

after their journey by rail and perhaps prevent their undue exposure to unfavorable conditions.

CARE OF THE BIRDS AT THE SHOW.

After his birds are safely delivered at the place of exhibition the fancier may find it possible to help get them promptly into their show coops in a position where the light is favorable and where there is plenty of pure air without danger of drafts. He should be on the watch for rumpy birds and prevent any such being brought near his coops.

He can probably arrange with the superintendent of the show or his assistant to leave all of the feeding, watering and care of his birds to himself.

After the birds are in place the fancier gives them food and drink, sponges off any soiled plumage and lightly touches the combs, wattles and shanks with vaseline.

No food is to be left in the coop and the water cup is emptied to prevent wetting of the birds and soaking of the litter on the floor of the coop.

Feeding and watering three times daily is sufficient but the birds may also receive pieces of apple to make up for the lack of green food. A little fresh beef cut into small pieces and fed from the hand will help to balance the grain diet of the show room. Chopped or sliced onions may be given to strengthen the rations. Grit should be provided daily. Any food that drops into the litter in the coop should be removed to prevent the fowls swallowing it with adhering bits of saw dust, shavings or straw.

After the day's showing is ended close down the front curtain and if the coop has an open top cover it with cloth or papers fastened securely in place.

If in spite of all precautions, the fowls begin to catch cold give them prompt treatment. Indications to be watched for are shaking of the head, sneezing, running at the nostrils, or dark dust collecting on the mucous at the base of the nostrils, watering of the eyes

and moping. Feed more chopped onions and give each afflicted fowl a two-grain quinine pill in a piece of fresh beef, night and morning.

When not attending to his fowls the fancier, of course, makes the most of his opportunity to inspect the other entries and confer with his fellow fanciers.

ATTENTION AFTER THE SHOW.

As soon as the show begins to break up the fancier personally attends to the placing of his birds in their own shipping coops or superintends the operation. He thus avoids all danger of mixing his fowls so that fighting and consequent mutilation of the birds will not occur in the coops.

Having made sure that he has his own prize winners safely cooped, he fastens the front curtain of the coops securely, tags the coops carefully and sees them on board the express wagon.

If possible he takes the train for home that transports his coops of fowls and is at hand to attend to them on arrival at the railway station and soon they are back in their fitting pens. Here the birds should remain quarantined, for at least a week, to make sure that they have brought home no contagious disease.

If no sickness develops and no more showing is to take place the fowls are removed on a mild comfortable day to their regular quarters.

If these birds are to be sent to other shows they may be kept in the fitting pens and training coops until

SCORING OF FOWLS.

Scoring is a method of determining, point by point, how a fowl compares with the standard of perfection for a typical bird of the breed or variety to which the fowl belongs.

A scale is arranged for each approved variety, giving to each section of the fowl a number of points to express the value of the same as compared with other

parts. The points of a perfect bird amount in all to one hundred.

For recording the defects and showing the standing of each specimen scored, a so called score card is used.

In scoring a qualified bird the specimen is critically examined and any short-comings of the parts in each section noted. A discount or "cut" is recorded upon the score card for each defect according to importance. After the examination of the bird, section by section, is completed, the cuts are added together and their sum subtracted from one hundred. Thus if the cuts amounted to eight and one-half the score of the bird would be ninety-one and one-half points.

At numerous poultry shows the judges score each qualified fowl entered in competition for the prizes. The cuts are recorded on score cards and the premiums in each class are awarded according to the scores of the birds thus officially determined.

The score card, for each fowl scored, is signed by the poultry judge and the secretary of the association, holding the poultry show, and usually becomes the property of the owner of the fowl.

Some fanciers never exhibit their birds at shows and yet may desire to have the standing of their fine birds determined.

Some breeders of pure-bred fowl seek to secure correct scores of all their valuable birds.

Purchasers of first-class breeding stock oftentimes desire to have the birds accompanied by score cards showing their correct standing.

If the owner of the fowls is qualified he may score them himself.

If not qualified he may employ a poultry judge or an expert scorer to do the work. Some breeders who can do the scoring themselves prefer to employ a specialist for the purpose, especially in case the fowls are to be offered for sale.

The poultryman who has not learned how to score

fowls may, if he is capable, in due time become sufficiently expert in the work. He should possess a natural aptitude for discerning the good points and the defects of birds of the breed selected.

The scorer must become very familiar with the standard requirements that relate to the breed or variety to be scored. He should study the illustrations of typical birds of the breed until their ideal shape is perfectly pictured in his mind. He should know the general and special disqualifications which exclude birds from competition in poultry shows even if he does not enter fowls for exhibition.

The instructions to judges and the table showing the range of points allowed in cutting for defects in the standard of perfection, must become well fixed in his memory.

Considerable experience in breeding fowls of the variety to be scored, is a very valuable part of the scorer's preparation for his task.

Acting as assistant to a veteran poultry judge or an expert specialist while scoring fowls is an excellent experience for the beginner in this line.

Instruction in scoring, together with some training and practice, is usually given in the poultry courses provided by many of our state agricultural colleges.

The scoring of fowls is one of the things that is best learned by doing. Under the guidance of an expert who can teach as well as score, the student, who has a talent for the work, will soon learn his lesson.

APPLYING THE SCORE CARD

Following is a sample score card.

NEBRASKA SCHOOL OF AGRICULTURE

Official Score Card of the American Poultry Association

Date Variety
 Owner Sex
 Address Band No.
 Entry No. Weight

	Shape	Color	REMARKS
Symmetry			
Weight or Size			
Condition.....			
Head and Beak.....			
Eyes			
Comb			
Wattles & Ear Lobes.			
Neck			
Wings			
Back.....			
Tail			
Breast			
Body and Fluff			
Legs and Toes			
*Hardness of Feather			
†Crest and Beard.....			

Total Cuts Score

*Applies to Games and Game Bantams.

†Applies to Crested Breeds

Name of Judge

Secretary

The scorer begins with the bird standing before him in its natural poise. Having the typical shape of the breed in his mind's eye and the standard of perfection for the bird in his memory he first looks at the specimen as it stands or moves about and studies its symmetry. He determines to what extent, if at all, the bird lacks in perfection of proportions or in harmony of parts, viewed as a whole, considering the type of the breed to which it belongs. If no decided defect appears

in this respect he passes this point trusting to future cuts for shape in the several sections to make up for leniency in this matter. If there is serious lack of symmetry the scorer cuts accordingly, remembering the value of perfect symmetry, which in the scale for most of the classes is eight points in one hundred.

The next point is weight or size. If the bird is in a class having a weight requirement, its actual weight will determine whether it is perfect or not in this respect. When no weight clause is given the scorer will cut only for decided departure from the standard size for the breed represented.

Condition is the next matter for consideration according to the score card. The bird is taken in the hands and cuts are recorded if the fowl shows lack of health or cleanliness and order of plumage, according to their seriousness and the total value allowed for perfect condition, in the scale of points for the variety in question.

Following these preliminary examinations the bird in the hands of the scorer is critically inspected as to shape and color of the successive sections from head to toes and cuts made where defects appear.

The total cuts and score are recorded and the date, the leg-band number, and other entries having been made the card is duly signed by the judge or other expert who scores the bird.

Since the weight, condition, and in some cases the color of the bird vary at different seasons, it is evident that its score may also vary somewhat. The score card is therefore a measure of the valuation of the bird's points (according to the standard) at the time of scoring.

The chief value of the score card records is not found in the statement of the sum of total defects or the "score" that results when this sum is deducted from the one hundred points of perfection. It is valuable and helpful mainly because it points out the sections wherein defects actually appear.

Two birds may have a like final score and yet be of very unlike value for breeding, exhibiting or selling purposes.

If a fowl shows excellence in most parts but is very defective in one or two sections the fancier may wisely discard him and choose another fowl which though having a like final score, makes up the total of its cuts by a number of minor defects distributed among the sections.

Especially is it important that a male bird should not be defective mainly in the shape of the head and its appendages. Particularly is this so if the bird is known to be prepotent in transmitting these faults to his chickens.

The scoring of fowls according to a scale of points is of lasting benefit to the poultry breeder because of the drill it gives him in the systematic study of his birds.

It is well for the progressive poultry man to learn the method and practice it even if he does not become an expert in scoring, for he thereby gains the habit of closely observing his fowls and estimating their values according to a standard of perfection.

JUDGING.

Correct decisive criticism of the points of pure-bred poultry according to a standard of excellence, calls for the exercise of particular powers of mind not possessed in perfection by the majority of men.

Perhaps a judge, like a teacher, is born and not made, but a poultry judge should be both born and made.

It is certainly no drawback to a judge of fine fowls to be possessed of judicial qualities by inheritance.

Honor, fairness and fearlessness are essential characteristics of an upright judge. He should be temperate, deliberate and decided, neither prejudiced nor partial in his ways and well balanced in judgment.

The poultry judge should also have an inborn liking

for the beautiful birds and have an eye for their points of superiority.

Having this excellent equipment of natural qualities, he may by the exercise of his talents in the school of experience gain such skillfulness as will warrant the employing of his services in adjudging the awards of prizes.

The poultry judge should become a persistent student of the standard and ought to have experience in breeding fowls of the class which he attempts to judge.

The tendency of the times is to specialize in poultry judging. The judge who has the necessary qualities and training and confines his judging to one breed or its varieties or to a single variety should prove capable of rendering most satisfactory service in the show room.

Deafness appears to be, in some ways an advantage to a judge and occasional dumbness is not a bad characteristic.

Certainly he should have a mind of his own and possess a large stock of common sense.

Expertness in the scoring of fowls is but one of the accomplishments of a good poultry judge. He should be qualified to weigh well and quickly, almost intuitively, the relative importance of minor and dissimilar defects in comparing birds showing close competition.

In some poultry shows judging is done by what is termed the comparison system. Score cards are not used.

In applying this plan, judges are instructed to consider carefully each and every section of the fowls, giving due value to both shape and color according to the standard scale of points for the breed.

Practically the judge does score the birds although no record of the defects is kept, except a mental one by the judge.

In shows where the classes are very large this system of judging by comparison allows of rapid work in awarding the prizes.

Whatever the system of deciding the awards, the

judge should be steadfast and uniform in his judging. He will thus win a reputation for reliability, secure and hold the confidence of exhibitors and please the poultry public.



THE MAPLES
Original Home of the Rhode Island Reds
Courtesy R. I. Agricultural Experiment Station

CHAPTER XI

Records, Accounts, Advertising

Unless the poultryman is gifted with a most extraordinary power of memory he should keep written records of all the important details of his business as they occur.

Even if memory does serve him particularly well, he should not tax it with many things which may be accurately committed to paper and preserved for years for the use of any one interested.

The great value of reliable records is as a means of reference. For instance it is of great advantage in the mating of pure-bred fowl to know, beyond peradventure, their past performance in growth, egg production, breeding or fancy qualities.

Carefully kept, continuous records also offer a means of comparison, year by year, and thus becomes a measure of progress in poultry culture.

The poultryman will find it convenient to use a card system for some of the records and loose leaves for others, while books may be utilized in some lines. For the cards box-holders are provided and these are kept in order in a suitable filing cabinet. The loose leaves may be of any convenient size, punched with holes near the edge for filing and be kept together by a Harvard binder, a Shannon file, a shoestring or a piece of narrow tape.

SPECIAL RECORDS.

Separate records may be kept of any matters, concerning which the poultryman may wish to have data for reference in his progressive poultry keeping.

The ingenious poultryman will not depend upon sam-

ple forms or suggested methods of keeping records, but will develop convenient forms especially suited to his conditions and purposes, so that they will contain, in condensed form, just the information desired for future reference.

The forms for special recording are to be kept posted where it will be easiest to use them. A pencil should be kept within easy reach so that the means of recording are always at hand and there is no temptation to omit the duty.

As the forms, if kept in the hen house, are likely to become dusty or stained, the poultryman may prefer to make temporary entries on sheets of paper and post the data in a book or file for preservation in neat, clean shape.

BREEDING RECORDS.—In breeding pure-bred stock, by line breeding, very accurate account should be kept of the matings and of the chickens resulting from the same. Use may be made of forms similar to that of the breeding chart already shown by diagram in Chapter II. By means of sealed leg-bands which are marked in series, A, B, C, etc., and by successive numbers, never repeated in the flocks of the poultryman, the breeding stock and the progeny may be designated with absolute accuracy. The breeder will then, by the records, know the relationship of the birds to each other with certainty.

The leg-bands also designate the fowl definitely in keeping other records of their performance.

EGG-LAYING RECORDS. An egg record of the flock as a whole or of individual layers is often kept.

The breeder of great layers, especially, desires to know what the hens of his breeding pens have done in their first laying season.

If only a few pens of fowls are to be kept track of, the attendant can soon learn to distinguish the eggs of individual layers and by having a record blank and pencil in a convenient place, he readily keeps tally of the eggs laid.

If the laying of many different hens is to be recorded, trap-nests become useful aids in the process.

The following form for keeping the laying record of a flock may be modified to suit the purpose of the poultryman and copies may then be printed for use.

MONTH—JANUARY										P E N H										YEAR—1919														
No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Totals	Notes	
E 22			1	1		1	1	1		1	1	1	1	1	1		1	1						1	1							20		
E 25							1	1		1	1	1	1	1	1						1	1	B									11		
E 37																																		
E 38	1	1	1	1	1	1	1	1	1	*1	D																					8	*Soft Shelled	
E 40																																		
E 43																																		
E 44																									1								5	
E 56								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	‡Double Yolked	
E 58				1			1			1	1										W											4		
E 61															1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	11			
E 63																									1	1						5		
TOTAL																															76			
B—broody; D—dead; I—introduced; W—withdrawn. Additional Notes: Weather very cold for																																		

B—broody; D—dead; I—introduced; W—withdrawn. Additional Notes: Weather very cold for first three weeks.
 Hen E 38, died suddenly of internal hemorrhage.
 Hen E 58, laid but few eggs of very small size.

INCUBATOR RECORDS. Keeping records of artificial incubating is very necessary if the operator desires to carefully consider conditions in searching for the causes of results.

Following is a form which has proved acceptable in recording conditions of machine hatching:

INCUBATOR NO. _____

Breed of Eggs	Number of Eggs	First Test		Second Test	Number Hatched
		Sterile	Dead	Dead	

TEMPERATURE IN INCUBATOR

DATES																							
INCUBATING DAYS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
MORNING																							
NOON																							
NIGHT																							

TEMPERATURE IN ROOM

MORNING																						
NOON																						
NIGHT																						

HUMIDITY IN ROOM

MORNING																						
NOON																						
NIGHT																						

NOTES

In the footnotes may be stated the per cent. of eggs fertile, per cent. of all eggs hatched, per cent. of fertile eggs hatched, number of cripples, weaklings, number of healthy chicks transferred to brooding place and any other items such as weather conditions, transfers of eggs, occurrence of blood rings, points in the history of the eggs, etc., etc.

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SITTING RECORDS. In hatching eggs by the natural method a record is readily kept by using stiff paste-board cards, one for each sitting hen, to be tacked up close to the nest.

The following is a sample of items that may be placed upon the sitting card:

SITTING HEN, NO. F 16.

Breed of Eggs.....
Eggs from Pen No.....
Date of Setting.....
First Test.....
 Infertile
 Dead Germs.....
Second Test.....
 Dead
Number Hatched.....
Number Cripples.....
Total strong chicks.....
Notes:

.....
Additional headings may be placed on the cards or comments may be made in the foot-notes covering such items as the parentage of the eggs, the method of feeding, housing and managing the parent fowls, their laying record at the time of producing the eggs that were set, the age of the hen when set, the breaking of any eggs in the nest and the washing of those unbroken, the transfer of eggs to or from the nest, changing the sitting hen, appearance of blood-rings at testing time, strength of chicks hatched, weather conditions, and any other information that the poultryman wishes to have recorded.

BROODING RECORDS. The record kept in natural brooding is simply the noting of any loss of chicks, day by day, and the stating of the causes if possible. A separate record for each hen's brood should be kept if convenient.

In machine brooding the deaths and other losses of

chicks should be recorded daily. The temperature within and without the brooder or hover may also be recorded according to the plan used for incubators. In the poultryman is testing or comparing systems of artificial brooding he may also record the conditions of humidity and ventilation, of fuel consumption and any other pertinent matters.

COLONY RECORDS. After the chicks are in the fields or yards, in colonies, the daily or at least the weekly deaths and losses should be recorded and notes made of any conditions of weather, housing, feeding or care that might bear upon the matter of mortality of the chickens.

FEEDING RECORDS. In working out a system of rations or method of feeding for a given purpose, such as egg production in late autumn and early winter or molting in mid-summer, the poultryman often tests different kinds of feeds, tries different proportions of certain feed-stuffs, or varies the method of feeding for given periods. In these tests he may wish to determine also the cost of food and of labor. Records may be kept on special forms adapted to the purpose of the tests.

NEW FEED-STUFFS become available from time to time and the progressive poultryman wishes to compare them with the feeds which he has been using. For example dried buttermilk which has been used for making paste is offered as a poultry food and the poultryman desires to learn how well it will take the place of beef-scraps in his fowls' rations. Again the question of feeding dry grain food or of moistening it with water before feeding is an important one.

The poultryman who experiments to solve these or other problems in their relation to his circumstances and purposes will arrange particular forms for recording the conditions and results.

LABOR RECORDS. Experimenting with different plans of housing or methods of feeding and management to determine the relative cost of the labor involved, under local conditions, are oftentimes desirable.

The records of such for given periods of time should give the amount of time and cost of the labor. Conditions of the weather, of the health of the fowls, of any variations of influences bearing on the experiments should be noted. The results should be carefully recorded and comparisons made.

If the final results point to the desirability of repeating the experiments, more recording will become necessary and the succeeding records should in form be similar to those of the first series of tests. Thus comparison of results is made easy and the final conclusions should be of value.

The poultryman is warranted in spending considerable money for experiments under his local conditions if thereby he may develop a system of management which will insure a continuous saving of labor in the operations of the poultry plant.

In all recording, simplicity rather than complexity is to be commended. The recorder should keep the main object in view and note simply the essential points of the conditions that bear directly upon the problem.

After records have been made they should be carefully preserved where mice, moths and molds can not injure or spoil them. They should be studied.

THE POULTRY MAN'S DIARY.

A daily diary of operations on the poultry plant is readily kept when one gets the habit of writing down the matters worthy of recording at a regular hour each day.

A loose-leaf diary has the advantage that the sheets of like date, for successive years may be kept together. Then at a glance the poultryman can see what was done on a certain date for several successive years. He can also ascertain when incubating or any other operation began in different years.

The diary thus becomes, in some degree a guide as to the proper time for doing various seasonable oper-

ations. It helps the poultryman to be ahead of time in his plans and on time with all his work.

The diary is an excellent place for jotting down the observations of the poultryman as to his fowls, purchases, sales, methods of management, tests of appliances, etc.

Incidentally the practice of writing out his opinions and the results of his studies, helps his decisiveness of judgment, strengthens his powers of close observation and exercises his talent for expressing his thoughts in condensed language.

POULTRY ACCOUNTS.

Book-keeping is the recording of business transactions in such a manner that a clear and accurate statement of the condition of affairs is always at hand.

Poultry keeping is a business—a financial undertaking—involving the investment of capital and payments for running expenses. A system of accounting is necessary if this business is to be conducted correctly.

The poultryman should keep records of all the income and expenses of his business in order to know whether it is profitable or not, what branches of the business are yielding profit or loss, where wastes or leaks occur, where to enlarge and where to retrench wisely.

Every business poultryman needs the healthy restraints resulting from the keeping of exact accounts of his receipts and disbursements. It not only promotes economy and enterprise but teaches order and system in management, diminishes temptation, discourages dishonesty and lessens the chances of litigation. The accounting poultryman knows his financial position.

If a son or daughter is given charge of the family flock of fowls, one of the conditions should be the keeping of the accounts. A poultryman who likes to

keep fowls but does not like to keep accounts may employ one of his children or some other member of the family to keep the books. This is an excellent way in which to begin the business training of the young people.

A poultryman may, if he wishes to avoid keeping full accounts, at least keep a cash account. In this case he simply charges against cash all money received and credits Cash with all money paid out on the opposite side of the account. The first item on the debit side is the amount of cash on hand. In closing the account at any time, the total credits are subtracted from the sum of the debits. This remainder should correspond with the amount of cash on hand and is made the last item on the credit side to balance the account.

The cash account is excellent so far as it goes but it does not express the financial condition of the poultry business completely.

SINGLE ENTRY ACCOUNTING.

In single entry- book-keeping the accounts are written down but once. All the entries are directly against the Poultry Plant on the debit side or in favor of the Poultry Plant on the credit side.

The first step is to prepare a complete inventory of all the property of the poultry plant at the time of commencing the account. This list is made on the pages of the account book so that it will be at hand for reference at any time. The actual valuation of each item of property is stated and the total amount is ascertained.

The account begins by charging the Poultry Plant with the total amount of the inventory list. On this, the debit side of the account, are entered successively as they occur, all the items of expense for feeds, labor, stock, tools, appliances and supplies of whatever kinds, every expenditure in fact made for the plant.

On the credit side are placed as they occur, all the items of income, such as receipts for eggs, dressed or

live fowls, feathers or anything else sold and every egg and chicken used for the household, given away or otherwise disposed of, with the price obtained or a fair estimated value when not disposed of by sale.

The accounts may run for any period as a year, half year, month or week. At the end of the time of accounting a new inventory is taken of all the property then included in the plant. The total amount of the new inventory is then entered on the credit side of the account. The two sides of the account are added separately. Their difference is ascertained. The figures representing this difference between the debit and credit totals, if they show a loss, are placed on the credit side to balance the account. If these figures show a profit for the period of accounting they are placed on the debit side of the account. The totals of both sides then show like amounts, that is they balance.

In continuing the accounting for another period, the inventory last taken is entered on the debit side and the account is carried on by entries of expense items on the debit side and of receipts on the credit side as before.

The same form of poultry account which follows is given simply as a suggestion showing one way in which the entries may be made and the account balanced.

This simple form of accounting may be expanded to show the amounts of the special lines of expense and income entries. For example the account book or sheets may be ruled with extra vertical lines to furnish columns additional to the regular account. This will permit of readily entering the amounts paid or received under headings such as feeds, wages, tools, (including machines and appliances) eggs marketed, eggs for hatching, broilers, roasters, capons, breeders, supplies for the household etc. etc.

The account thus has some of the advantages of

The following form will sufficiently illustrate the method suggested:

SAMPLE AMPLIFIED FORM OF POULTRY ACCOUNT

DR. 1908 PARADISE POULTRY FARM

			Feeds	Work	Tools	
March 2	To inventory	\$1262.00	\$		\$	\$
" 3	" 10 bu. wheat @ 90c	9.00	9.00			
" 5	" 1 incubator	20.00			20.00	
" 5	" 1 brooder	12.00			12.00	
" 5	" 5 gal. oil @ 15c	.75				
" 9	" picking broilers	3.00		8.00		
" 14	" 500 bls. beef scraps @ \$2.50	12.50	12.50			
" 31	" month's wages.	35.00		35.00		
	Totals					

PARADISE POULTRY FARM 1908 CR.

			Market Eggs	Br'ilers	B'ding Stock	Household
March 9	By 30 doz. eggs @ 20c	\$ 6.00	\$ 6.00			\$
" 9	" 25 pr. broilers @ 90c	22.50		22.50		
" 9	" 8 doz. eggs, household @ 20c	.60				.60
" 10	" 1 pen breeding fowl.	8.00			8.00	
" 16	" 60 doz. eggs @ 18c	10.80	10.80			
" 23	" 5 doz. eggs, household @ 17c	.85				.85
" 30	" 40 pr. broilers @ 80c	32.00		32.00		
	Totals					

DOUBLE-ENTRY ACCOUNTING.

If the poultry business is conducted on a large scale or the keeper of fowls desires to keep thoroughly posted as to each part of the business, it is well to keep a set of books by double-entry.

The poultryman may choose to keep the books himself if he has had the requisite training or he may employ someone skilled in accounting. Such a person will be familiar with business terms and the signs and abbreviations used in regular book-keeping. If familiar with the details of poultry-keeping, he can keep the poultry accounts without difficulty.

A few special points are given in the hope that poultrymen who are interested will be induced to give to accounting the attention which it deserves.

The main advantage of the double-entry system is that each branch and interest of the business may have its separate account, kept ready for balancing at any time. A gain or loss in each representative account can be quickly ascertained. There is thus furnished a very effective guide in the management of the business.

The accounts as they occur may be entered in a Day Book. In this book of original entries there should be no erasures.

From the Day Book the items are posted to the Journal as soon as convenient. It is possible to dispense with the Day Book and enter the items directly in the Journal.

Three simple rules in journalizing are the following:

1. Debit whatever costs value, or the thing received.
2. Credit whatever produces value, or the thing parted with.
3. When a debit is entered there must be a corresponding credit entered and when a credit is entered there must be a corresponding debit entered.

The accounts are then ready for posting to the Ledger, wherein are kept the separate accounts.

When an entry is made on the debit side of one oc-

count the corresponding credit is recorded in another ledger account. For example a check paid for labor is debited to Wage Account and credited to Bank Account;

Accounts may be opened under separate heads with any department or interest of the poultry plant, such as Real Estate (including Land and Buildings), Buildings and Yards, Bank, Income from Stock and Eggs together or separately, General Expense, Special Expense of Feeds, Labor, Advertising, Marketing, Postage and Sundries.

If capital or funds are to be borrowed there should be an account with Bills Payable. If sales are made on credit there will be an account with Bills Receivable. These may include interest items or if desired there may be a separate account kept with Interest.

Accounts are opened also with parties who loan money to the poultryman and such as buy of him on credit, or borrow of him.

It is well to have an account with a bank, deposit all moneys received and make all payments by numbered checks on the bank. Each check duly indorsed by the receiver is, in fact, equivalent to a signed receipt for payment. Money required for small cash purchases may be drawn by check from the bank. This plan helps to simplify the accounting and checks mistakes.

The Ledger becomes a collection of records of the income and expenses of the poultry plant in its different departments and at any time the accountant, by taking a trial balance, can show the exact financial status of the business.

Just before taking a trial balance the bank book should be written up to date. Add the debit and credit items of the Journal for the period of balancing. The totals of the credits should equal the total of the debits. Make sure that all the Journal entries are posted in the Ledger under the proper headings. Take a sheet of paper ruled like a ledger leaf. Begin with the first account in the Ledger, add the debit and

credit items separately and deduct the lesser total from the greater. Enter the difference on the debit or credit side of the balance sheet according to which it belongs. Continue footing up the successive accounts and place their debit or credit balances on the corresponding sides of the balance sheet. Accounts which balance may be omitted from the sheet. Add the two sides of the balance sheet separately. If the totals are alike the accounts have been properly posted from the Journal to the Ledger.

Turning now to any account the poultryman can ascertain its standing and know just where his funds are held.

SUMMARY OF ACCOUNTS.

In keeping the books of the poultry plant, however frequently the separate accounts may be balanced or a trial balance taken, there is customarily an invent-orying and balancing at the end of the year which in-cludes the complete accounts of the business.

In the annual closing of the books due attention should be given to the expense of taxes and insurance, mortality of stock, and depreciation in value of build-ings, fences, tools etc. Some of these items, being de-finitely known, will have been recorded when they occurred. Others may have to be estimated

New buildings, machines, appliances, vehicles and young horses may, however, show little if any de-preciation in condition or value for several years and then, perhaps, suddenly lose greatly in value or be-come useless and therefore valueless. In the invent-ory and accounts it is possible to distribute the de-preciation over a series of years by what is termed amortization. The buildings etc. are inventoried at cost and the account debited yearly with a given per cent. of the cost for depreciatlaon. For example it is fair to fix the average period of effective usefulness of tools and machines at ten years, in which case the ac-count is debited annually with one-tenth (ten per cent.) of the cost of the article. If we allow twenty years

as the period of usefulness of poultry buildings then the account may be charged with five per cent. of the first cost of buildings. For mortality of stock a deduction of ten per cent. of the value may be made yearly.

The complete summary of accounts should show accurately the inventories of real estate, stock, tools and feed on hand, the sources of income, the amounts of receipts from each, the expenses for the various divisions, feed, labor etc., the cash assets and liabilities and the gain or loss for the period of accounting.

While the details of the double-entry system of accounting may seem to be somewhat intricate it is in reality easily applied to the poultry business and the results in practice are exceedingly satisfactory.

ADVERTISING.

Effective advertising makes and increases sales. Advertising pays if the business is large enough, the products sufficiently plentiful and customers are wanted.

An attractive poultry farm, beautiful birds, excellent exhibition records, exceptional laying records are all good advertisements of the plant and its products.

Exhibiting fine birds at poultry shows is one of the best methods of advertising pure-bred and fancy stock.

The man who begins on a small scale and gradually builds up a large, profitable business is himself a good advertisement and likewise usually a good advertiser.

On the other hand special advertising is costly, and injudicious advertising is one of the easiest ways of sinking good money beyond recall.

ADVERTISING MARKET PRODUCTS.

If the poultry products are to be sent into the wholesale markets and disposed of on commission, advertising is usually unnecessary.

The poultryman may, in this case, consider the ad-

visability of attempting to secure a better disposal of his products by advertising. If he finds that the cost of advertising and increased expense of preparing and delivering the goods would exceed or equal the increased returns there is no inducement to advertise.

If the producer decides to seek for private customers to take his particularly fine products, at extra prices, he may begin advertising by personal solicitation or correspondence. Having made a beginning he should see that the quality of his products is a continual advertisement. Each satisfied and pleased customer is likely to speak a favorable word for the products and help to win new customers for the poultryman to supply. The producer, if he wishes to extend his trade, should make sure that he can supply the goods of the quality desired and at the times wanted. He should sell only first class stuff to these special customers. If he has second class products to dispose of at any time he can send them into the general market.

The cartons and crates or packages in which eggs and dressed fowl are delivered to customers should be neatly and attractively labelled to advertise the poultry farm and its productions. Printed cards or leaflets may be placed inside the package to further advertise the merits of the contents.

If increase of trade is sought it may pay to advertise in the city daily paper or the weekly paper that circulates among the families who are desired as patrons of the progressive poultry plant.

Fine, broilers, roasters, capons may be advertised by letters sent to proprietors or managers of hotels, restaurants, clubs, caterers or fancy grocers. Samples of the products may accompany the letters if the advertising will be made more effective thereby.

ADVERTISING BREEDING AND FANCY STOCK.

The poultryman who would cater to the demand or create a demand for better fowls will do well, in the

first place, to select a breed or variety that is popular because of both its beauty and its utility.

The breeder who introduces fine pure-bred poultry into a community usually finds that the fowls advertise themselves. There often is opportunity to sell surplus stock and eggs for hatching, at an advance over the market price, in the neighborhood. A bulletin board at the entrance to the farm, by the highway, or a notice posted at the local store or post office provides an economical and effective means of advertising the products. The notice should be clearly, correctly and carefully expressed or it may advertise the poultryman in an undesirable way.

ADVERTISING IN PERIODICALS.

If the breeder of fine fowls knows that his surplus of chickens and eggs will be greater than needed to supply the local demands he seeks a means of extending the area of his sales.

Probably the best mediums for advertising pure-bred stock are the leading poultry journals. These papers have been informing their readers for a long time of the characteristics and relative value of the standard breeds and varieties of poultry. The readers have learned to appreciate quality of stock and eggs.

Agricultural papers that give considerable attention to poultry interests are sometimes good mediums for poultry advertising.

Magazines that treat of country and suburban life and interests, of outdoor recreations and household economy may prove useful in making known the poultryman's desires for purchasers of his fine productions.

The intending advertiser should ascertain as definitely as possible, before placing his advertising, what periodicals reach the class of people who would wish to purchase his line of products. Some papers are patronized by subscribers who care mainly for fancy or exhibition stock while others are favorites with such as are interested chiefly in breeds, valuable for their useful products. Still others cater to the large and

increasing class of people who are interested in breeds noted for both fancy and utility qualities.

It may be somewhat difficult, at first, to select the best magazines for one's purpose, but after a little experience with several mediums, watching the sales resulting from advertising in each, the advertiser can readily decide which best answers his purpose.

SEASONABLE ADVERTISING.

The advertisements should be seasonable. While it is always desirable to keep one's advertising going continuously it is advantageous to vary the wording according to the season and the special products for sale at different times.

During late winter and early spring readers may be informed of the opportunities to obtain eggs for hatching.

In early summer, after the breeding season is past, the poultryman may wish to dispose of his old fowl to make room for the young stock coming on. He advertises accordingly.

In late summer and early autumn there is a call for exhibition stock. Cockerels for breeders and pullets for layers are much in demand later in the fall.

The producer makes known his readiness to supply the demands of possible purchasers, through the advertising columns of the papers patronized by these people. When he has no special stock or product to dispose of he uses his advertising space to keep his poultry plant in the remembrance of people who may wish to purchase its products later.

SIZE OF ADVERTISEMENT.

The space to be used for an advertisement depends upon the quality and quantity of the products to be offered for sale, the nature of the proposition to be made and the funds available for advertising.

The producer does well to begin with a small advertisement, which may prove to be sufficient for his

purpose. It will be easy to increase the size of the advertisement if the circumstances warrant it.

Doubling the size of the advertisement does not usually result in doubling the number of inquiries or sales.

The cost of enlarged advertising is great and is warranted only by correspondingly large returns.

Large space, if skilfully used, will attract increased attention, enhance reputation and help to establish and maintain a strong standing for the poultryman and his plant, among poultry people.

PREPARATION OF ADVERTISEMENTS.

An advertisement should be worth reading. It should tell its tale strikingly, straightforwardly and succinctly.

If the stock or product to be offered for sale has peculiar points of value or particularly strong points of superiority these should be emphasized in the advertising.

Winnings at important poultry shows may well be mentioned in seeking to sell exhibition birds or eggs and chickens from such prize stock.

Records of abundant laying, secured by trap-nesting, may prove drawing features in advertising breeding stock.

A peculiarly attractive or valuable characteristic of fine feathering, excellent breeding, prolific production of eggs, or strong body growth, if strikingly expressed will arouse interest. If this can be expressed in the terse terms of a catching clause or startling sentence the same may appear in each advertisement and will give to the advertising a uniformity and continuity that are desirable.

If the poultryman lacks the talent for writing advertisements he may find it desirable and profitable to employ an expert advertiser to prepare the advertisements for him.

If his advertising is extensive and especially if he wishes to make use of many mediums he may find it advantageous to place this business with a reliable advertising agency.

ANSWERING INQUIRIES.

The advertising in the newspaper is only a beginning. Inquiries should be personally answered by letters giving prices and terms, and circulars, catalogs or booklets, explaining completely the particular points of the products offered for sale and the advantages of their purchase.

If the letter be typewritten the circular may well be printed in type-writer type or produced by manifolding a type-written letter.

If a booklet or catalog is used it should be carefully prepared, neatly, clearly and attractively printed and if possible illustrated with cuts of the poultry plant, of prize birds, etc., to help induce the reader to become a purchaser.

For the correspondence attractive letter-heads should be used which will further advertise the business. All correspondence with inquiring parties should be prompt, persuasive and to the point. Courteousness in expression, correctness in grammar and spelling, and clearness in writing as well as meaning, are characteristics that will count in making sales to correspondents.

Reference to a local bank or other financial institution will conduce to confidence in the business standing of the advertiser.

If the first letter and accompanying printed matter fail to win an order or secure further inquiry, another letter may be sent, politely emphasizing the desirability of the correspondent becoming a purchaser.

Some advertisers "follow up" the inquirer with successive letters until an order is secured or the case appears hopeless. Others continue to send letters even after the addressee lies silent in the grave.

FILLING ORDERS.

The advertising is continued by the appearance and quality of the stock or product selected to fill the orders which are received.

Poor products will promptly nullify good advertising. It pays to satisfy all purchasers except "sharks".

KEYING.

The advertiser should make use of his experience in advertising to determine the placing of further advertisements.

He must ascertain which papers have brought small returns (if any), which large returns and which the best results. In order to accomplish this purpose the advertisement in each medium should be keyed, that is, it should have a peculiarity of address or other feature which will enable the advertiser to distinguish the paper which brings each inquiry.

This is readily brought about by giving the address of the advertiser differently in each medium. A different street number, a change in the P. O. box number or a department number or letter may be used. As the inquiries come in they are listed according to the keying. If the inquirer fails to use the keyed part of the advertiser's address the answer to his letter may contain a request that he state where he saw the advertisement which induced him to write. An addressed, stamped envelope or postal card may be enclosed to insure a reply.

TABULATING RESULTS.

In order to know the actual results of advertising in different mediums the advertiser should tabulate the data made available by the keying of the advertisements.

This is easily done by means of a card system. A card is provided for each journal carrying an advertisement. The number of inquiries resulting from each paper is recorded daily.

On the same card may also be noted the number of sales resulting from these inquiries.

A little figuring enables the advertiser to determine accurately, for a given period of advertising, the number of inquiries and resulting sales that have come

from each journal. Knowing the cost of the advertising he can compare the expense with the number of inquiries and ascertain the cost per inquiry. Further calculating will give the expense in advertising per order or sale and per dollar of sales.

The poultryman thus learns at first hand, the comparative value of the different mediums for his conditions and purposes. There could be no better guide for his further advertising.

INDEXING INQUIRIES.

An extension of the system of records may include a card listing of inquiries. When an inquiry comes in the date of receiving, name, P. O. address, and source of inquiry are noted on a card. The date of sending answer and of succeeding letters and replies may also be entered on this card.

The cards are filed alphabetically, unless they are numerous. If very many inquiries are listed the cards may be filed by States and Post Offices.

Reference to a card will show how much correspondence has been required to secure a sale.

In case an inquiry comes from a town where an order has been filled satisfactorily, the poultryman can refer the inquirer to the previous customer and very likely secure another order.

By this plan of indexing a list of the addresses of many persons interested in the poultryman's products is obtained and these may be informed by mail when he has further sales to make.

Letters from correspondents should be kept in convenient files for reference and copies of replies are also preserved. The poultryman, when he notices by an indexed card, that an inquirer has failed to place an order, may refer to the correspondence and usually determine why a sale was not effected. Having the name and address of the inquirer he may be notified of new opportunities to purchase desirable stock or eggs for hatching when the poultryman has them to offer.

It may appear to the practical poultryman that the keeping of records and accounts, the listing, and tabulating of advertising data, the filing of inquiries and of replies and the conscientious studying of all these records involves much labor with perhaps meager results. Fair trial of such of the system as suits his case, will surely prove that the work is easy and takes but little time daily, while the information thus gained will aid him greatly.



Courtesy Mr. Cozzens

CHAPTER XII

Methods of Management

Study and practice should travel together in the poultry business. As the consequence of earnest studying and accompanying experience in keeping fowls, there should be constant progress in poultry culture.

Actual personal care of the fowls gives the thinking poultryman a clear insight as to the application of the principles which he has studied. It clinches the facts which he has learned and makes them a part of his experience.

The poultryman who faithfully studies his subject and starts on a small scale in the keeping of poultry, solving one by one the problems of breeding, feeding, incubating, brooding, rearing, finishing and marketing according to his own circumstances and ascertaining what local conditions favor or obstruct his progress, is prepared to push forward intelligently and successfully in his chosen calling.

While learning to overcome the obstacles and to utilize the advantages peculiar to his environment, he finds out what lines of poultry keeping are most profitable and best suited to his purpose amidst his particular surroundings. He is then in a position to develop his business along those lines strongly and wisely.

There is supreme satisfaction in watching a poultry business grow gradually, under one's guidance, from a small beginning to something worth while. This is accomplished by good management.

GENERAL MANAGEMENT.

Management is defined as the manner of treating,

directing, carrying on or using for a purpose. The purpose in poultry culture should be well defined in the mind and plans of the manager.

The directing of a business poultry farm should be such as to secure a yearly profit while the flocks and the farm are constantly improving in value.

For ideal management the conditions and factors should be under complete control and the operations in detail should be executed systematically, promptly and energetically.

BEGINNING THE BUSINESS.

Two important matters for the beginner to decide are the time of commencing the keeping of fowls and the selection of a breed suited to his purpose.

SEASON FOR STARTING:—A simple rule is to begin when ready. Trouble usually comes from beginning before one has sufficiently studied the subject or provided an adequate equipment.

In the spring time the impulse to start things is strong. If one wishes to begin by purchasing eggs for hatching there is no better time and only a small equipment is necessary. Spring conditions favor successful hatching and the natural influences are conducive to thrifty growth of the chicks.

If the poultry culturist starts on new ground where poultry has not previously been kept and employs artificial methods of incubating and brooding or exercises sufficient precaution in natural hatching and brooding, he may avoid the dangers that come because of parasites and disease germs often prevalent on an old poultry plant.

The interested enthusiastic amateur will usually be so attentive and careful in his work with the chicks that, even though inexperienced, he will be successful and skill will come by continued correct practice.

If one prefers to start by purchasing breeding stock he may, by the exercise of patience and watching for an opportunity, secure good tested breeding fowls after the spring season is past. Excellent mature stock is

sometimes obtainable in early summer at very reasonable prices. The chickens raised from the eggs of these birds the first year will be late hatched but should show the quality of the stock.

Well developed pullets may occasionally be bought in the fall but are likely to be high in price.

Good stock purchased at almost any season should soon begin to bring returns in eggs.

The experience of the first season in keeping the fowls will be a good preparation for successful operations the following spring.

If the poultryman has his buildings to construct, the best season for starting is the early fall, unless the locality is subject to heavy or continuous rain storms. Usually in the autumn the roads are in excellent condition for carting the lumber. After the summer's heat the lumber should be in dry condition. The early autumn days are usually pleasant and sufficiently cool for comfortable working. The houses become well dried out, as they should be, previous to using them for sheltering fowls.

If the poultryman constructs the poultry buildings himself or wishes to aid in their construction, he may choose a season of the year for this work when he can best attend to it.

SELECTING THE BREED:—The poultry keeper should choose a pure-bred variety of fowls. Accurate descriptions of the numerous accepted breeds are given in the copyrighted Standard of Perfection published by the American Poultry Association. There is ample opportunity for the choosing of a variety well suited to the local conditions and the purpose of the poultryman.

If the poultry keeper seeks to obtain eggs in large numbers he will probably select some variety of fowl of the Mediterranean class which includes the Leg-horns, Minorcas, Black Spanish, Anconas and Hamburgs. Fowls of this class are naturally great layers of white-shelled eggs and certain varieties and families have been bred for egg production for a long time.

Though small in size they are also toothsome table fowl.

If the poultryman desires to secure both abundance of eggs and excellent market fowl he will find the American class of fowl well suited to his dual purpose. The Plymouth Rocks, Wyandottes and Rhode Island Reds are the leading breeds of this class.

If poultry meat is the main object of the business he may see fit to select some breed of the Asiatic class such as the Light or Dark Brahma or one of the Cochinchina varieties.

The poultry fancier who wishes to keep fowls for the pleasure of having feathered pets or breeding exhibition birds, can choose any of the attractive varieties of the classes already mentioned or may select something suitable from the Games, the French or English breeds or the beautiful Bantams.

While the breeds of poultry are grouped into classes according to some general or peculiar qualities which they have in common, it is true that under the management of skilful breeders almost any of the standard varieties may be bred to excel in any desirable characteristic.

For example although the Brahmas and Plymouth Rocks are particularly well adapted to the production of large roasters and capons there have been developed strains of these breeds which excel in the laying of abundant brown-shelled eggs. Any of the varieties which are valuable because of their egg and flesh production may, in the hands of the fanciers, be bred for fine feathers.

The poultryman is usually wise if he selects one rather than many varieties of fowl for his poultry farm. He may think it advisable to try several varieties and by a process of testing and exclusion determine which one is best adapted to his conditions and his purpose.

DIFFICULTIES IN MANAGEMENT.

In managing a poultry plant there may be serious study, perfect planning and energetic execution of du-

ties and yet lack of complete success because of unforeseen or uncontrolled influences that affect the living fowls unfavorably.

The successful manager should be master of details but some of the factors of poultry farming are occasionally beyond control. The management has to deal not alone with poultry but also with people. Skill is required in caring for the former and tact in dealing with the latter.

The methods of the poultry manager must needs be somewhat elastic because the conditions can not always be forecasted or completely controlled. However well the poultryman may plan, the details of operation, when it comes to practical execution in managing hens and humans there is liability of interference because of inclement weather, enemies, evil habits, poisons, sickness, foolishness, etc.

The poultryman should, therefore, be capable of intelligent calculation as to probabilities and resourceful in emergencies.

THE WEATHER:—The main point in making allowance for unfavorable weather is to be always prepared for any kind of weather and never to be caught napping.

The equipment of the poultry plant in structures should be ample for protection and the shelters easily available when needed. Great numbers of little chicks are sacrificed yearly because of lack of sufficient shelters conveniently placed and quickly accessible in case of sudden electric storms. Chickens are not always wise but they are very much creatures of habit. If they become accustomed to seeking protection from the heat of the sun in certain places they are very likely to seek the same shelters in a pouring rain or sweeping wind.

Making the shade shelters on the ranges safe harbors from winds and wetness will allow many chickens to escape destruction. Many a fine brood of chicks is drowned out because of lack of forethought in locating the brood coops. These should be placed on elevated, well drained spots and never in hollows or level sit-

uations where rain-water or flood-water is liable to collect into puddles or ponds.

During spells of inclement weather the poultryman should be alert to prevent injury or loss to his flocks or equipment. He should himself see that the fowls are safe and comfortable. He should be watchful of the action of storms and floods, heat and cold, upon his poultry plant and its inhabitants in order that he may promptly remedy any untoward condition and prevent possible damage.

Deaths by thousands occur annually in the artificial brooding of winter hatched chicks because of lack of ample heating power in the brooder houses. If the chicks cannot be kept comfortably warm during the worst weather the probable results will be chilling with consequent diarrhea and subsequent death.

Hundreds of thousands of eggs are not laid in the fall and early winter because fine flocks of pullets are placed in houses that have not been properly dried out, are not properly ventilated or are subject to excessive drafts. Chilly, damp weather, under such conditions affects the fowls injuriously.

In all that relates to the weather the poultry manager should have the fullest control possible in order that the fowls may be kept comfortable and yield profitable products.

ENEMIES:—Sometimes the unexpected happens and the poultry plant suffers by the depredations of enemies.

RATS AND MICE:—Small rats and mice may not destroy chickens, but if opportunity offers they devour or injure poultry feeding stuffs. These little pests are also liable to bring tape-worms, other parasites and disease germs into the chickens' quarters.

Large rats are devastating destroyers of chickens. They delight in murdering little chickens. A blood-thirsty rat can deal out death to fifty chicks in as many minutes. Brooder chicks are their especial victims. A veteran rat will catch a chick by the nape of the neck or back of the wings, and drive his sharp teeth into the spinal nerve causing almost immediate death. The

dying chick is then hidden under the brooder or in any convenient place and the rat returns for his next victim. Unless interrupted the slaughter may continue until the brood of chicks is exterminated. To catch a cunning old rat will sometimes tax the patience and ingenuity of the shrewdest poultryman to the uttermost.

The most effective method of capturing these villainous vermin is by means of steel traps or guillotine traps. Several of these traps may be set in the runways of the rats and looked at daily. Sometimes the traps should be baited with bread, cheese, flesh or other food. At other times the traps or some of them should be left unbaited. They may be left sprung in the run ways for several days and then set. They may be left uncovered or have a few feathers or light chaff scattered over them. Many rats can be caught if the trapper will give his attention to the setting of the traps daily and change his tactics frequently.

The French wire traps will sometimes catch large numbers of rats. Placing them where the rats have passage ways, they are often very effective for a while. Leaving a live rat in the trap sometimes helps to entice others to enter.

Poisoning by means of the rat killers sold on the market or by using arsenic, phosphorus or strychnine in bread or flesh may be practiced effectively in some cases.

Mixing flour with plaster paris, half and half, and placing the mixture in a saucer, with a dish of water near by, may tempt rats or mice to their death. If they eat of this mixture and then drink water the plaster solidifies within their digestive organs and prevents their further depredations.

A cask may be provided with a cover nicely balanced at its top so that if a rat or mouse steps upon the cover to get food he will be promptly toppled into water with which the cask is partially filled.

In using traps, poisons and other methods which are

dangerous to chickens the latter should be fully protected from risk of injury.

Cats:—The poultryman's or his neighbor's pet cat, innocent feline, sometimes grows fat on chicken fare. Wandering, homeless and semi-wild cats may make sad inroads in the flocks of chickens.

The home cat should be trained when a kitten to leave the chickens alone. Punish the kitten even if she jumps at a chicken in play. An excellent method of correction for cat or kitten is to place her within the coop of the mother hen and let the latter give the feline a lesson in pecking, at close range. A cat that is a good ratter and that will not injure chickens is a desirable creature to have in the poultry plant. Several such may well be kept as a prohibition to rats and mice.

Dogs:—A good dog will prove a very desirable defender of the flocks and property of the poultry plant from all other animals, including thieves. Bull dogs, Collies and Rat Terriers have proved particularly good protectors of poultry.

Some dogs however will catch chickens. There is especial danger from this source if vagabond dogs are allowed free range in the community. Fences often fail to protect fowls from such enemies especially if they travel in couples or companies on their foraging expeditions.

Any prowling cur that is a menace to the poultry should be shot dead if the law permits and there is no danger of reprisal by an angered owner. The least that can be done is to pepper the trespassing canine with bird-shot as a sign to keep his distance.

Foxes:—Foxes are very cunning but also very cautious. If these lovers of poultry and enemies of poultry-keepers are liable to visit the poultry plant a good fox hound may prove useful. Traps or gun may be brought into play. If a fox den is discovered its inmates may perhaps be smoked out by burning brimstone. Foxes do not however usually commit their depredations in the neighborhood of their dens.

To arouse the suspicions of a fox and cause him to

avoid the hen house, loose pieces of chain or metal may be hung at the places where the fox would seek to enter. Another precaution is to brush tar upon the wire fencing of the yard near the fowl house.

COYOTES:—Where coyotes are plentiful, poisoning with strychnine as much as can be held on a small knife-blade, concealed in a piece of flesh, is practiced successfully.

MINKS, OPOSSUMS, SKUNKS, AND WEASELS:—These creatures prey upon poultry if opportunity offers. They may sometimes be caught in steel traps. The skunk's burrow should be sought and if found carbon bisulfide may be used to destroy its inmate. This compound is a liquid which exposed to the air, quickly changes to an inflammable gas. Placing about two ounces of the liquid in the burrow and quickly closing all entrances will cause the suffocation of the inhabitant within. As the gas is explosive no lighted match or lantern should be brought near it.

Prevent the presence of any or all of the animal enemies in poultry houses at night by covering possible entrances with wire netting, screening or shutters of some kind.

Reduce the chances of visitations of animals of prey by keeping the premises near the hen house clear of stone heaps or walls and piles of brush, old lumber or other rubbish, which might provide harboring places for the robbers.

HAWKS AND CROWS:—The winged enemies of our domestic fowls prove very destructive in some localities. One swoops down upon a flock of chickens, seizes a victim and flies away with it. A good dog, if on the alert, will prevent such visitations.

The poultryman, if he is a good marksman, may use a rifle or shot gun to reduce the number of crows and hawks in his locality. Crows are not good mathematicians. If two persons go out to a hiding place and one returns, the one who remains will very likely have opportunity for a shot at the crows.

Hawks have been successfully trapped by setting

a steel trap on a piece of board nailed at the top of a high pole.

Crows are very suspicious, cautious creatures and may sometimes be kept away by running twine from tree to tree or on poles across the ranges or yards of the chickens. Bright strips of tin strung upon the lines may help to keep the crows at a distance. Scare crows are in some cases effective and in other cases useless in preventing the visits of the crows. A figure closely resembling the human form, having loose sleeves that fill and flutter in the wind is likely to deter the crows from swooping upon chickens near by.

THIEVES:—The meanest of mauraunders is a man who would rob a hen-roost.

A faithful bull dog will usually prevent losses by thieving.

Frequent gun practice at irregular times, day and night, especially if the gunner gains the reputation of being a "sure shot" will tend to cause robbers to shun the premises.

Electric alarms in the hen houses and connecting with the poultryman's sleeping quarters serve to give warning of unwelcome visitants at night.

The judicious circulation of information near and far as to the installation of the electric alarms on the poultry plant, their wonderful detective powers and the skill of the poultryman in the use of fire arms may have a restraining influence upon persons thievishly inclined.

VICES.

FEATHER PULLING: Fowls sometimes acquire the bad habit of pecking at the feathers of one or more of their number until parts of the body become naked. Male birds are especially liable to have the neck feathers pulled in this way if the flock is kept in close confinement with lack of exercise. Unbalanced rations, lack of green food, absence of meat food and of grit and neglect to provide for the natural needs of the fowls all favor the forming of this evil habit.

In extreme cases the fowls may turn cannibals. When the pulling of a feather draws blood, the fowls are set wild by the sight and taste of the red fluid, and may peck the victim to its death.

If the habit reaches this stage or any of the fowls of a flock become confirmed feather pullers they may be killed and used for the table. To overcome or prevent this vice the rations should be corrected, plenty of room allowed or straw used as litter and small grain scattered in it to encourage natural exercise.

The naked neck of a victim of feather pulling may be smeared with carbolated vaseline.

EGG-EATING:—Fowls do not prove profitable when they become consumers of their own products. The habit of egg-eating may be readily started if a soft-shelled egg is dropped and breaks open on the floor, or if eggs are crushed by the layers in the nests. Egg forcing foods, the use of condiments and the lack of crushed oyster-shells or other supply of carbonate of lime tend to the production of eggs with soft shells.

A sufficient number of attractive nests will help to prevent crowding at laying time. If the nests are secluded or darkened there will be less tendency of the layers to crowd into one or two favorite nesting places. Nests may be made having canvas bottoms with a hole in each through which the egg, as soon as laid, drops into a space below the nest. Such nests should be well darkened and soft cloth or chaff should be placed underneath for the egg to fall upon.

Any fowls that become confirmed egg-eaters should be used for the table.

DRINKING OR EATING FILTH:—Fowls sometimes acquire abnormal appetites and become addicted to drinking at sink-drains, barn-yard pools or stagnant puddles or devour excrement, decaying flesh, etc. Digestive disorders and diseases are liable to follow.

In warm climates if the fowls find a decomposing carcass of any animal and feast upon it they are very likely to suffer from ptomaine poisoning, resulting in the so called "Limber-neck" and slow death.

The fowls must be prevented from indulging in these practices by keeping them away from such temptations or by removal of the opportunities for satisfying their abnormal cravings.

Proper feeding and good management will usually save the flocks from acquiring the vices which frequently result because of carelessness or neglect on the part of the poultry-keeper.

LEAKS AND WASTES

Management which allows of leaks and wastes on the poultry plant is faulty.

Capital may easily be wasted by placing the poultry plant in a location unfavorable to the fowls or unsuited to the conduct of the business.

Money invested in buildings, which are not adapted to the keeping of fowls or are erected upon unsuitable sites is worse than wasted because the use of such structures entails continuing waste of effort.

In some cases the buying of exhibition stock, at fancy prices, for breeding purposes, is equivalent to throwing away money.

Food is easily wasted by feeding mash on the ground or in open troughs from which it may be scattered and lost. Wet mash fed in excess, and the surplus left to ferment, will entail loss and may become a cause of disorder or disease.

Feeding rations, which are unbalanced, especially if these contain an excess of costly protein feed-stuff, is wasteful.

Allowing nourishing products of the farm to go unused or failing to grow food crops on the poultry plant when such can be produced economically and then buying feed-stuffs for cash to make up the rations is mismanagement. Compelling the fowls to keep up their body temperature by consuming additional food because of failure to provide comfortable shelter does not help to increase the profitable productions of the poultry farm.

An enormous waste of life among fowls results from bad management, neglect, accidents, disorders, diseases, parasites and enemies.

By careful control and good management many of the destructive conditions can be corrected and large losses, thereby, prevented.

BY-PRODUCTS

It is an important part of the management of the poultry business to save and utilize or sell the by-products.

FEATHERS:—At the time of picking the fowls the feathers should be sorted, the soft feathers being kept separate from the quill feathers.

Feathers which are dry-picked may be spread upon the attic floor of a dwelling house or in a loft that is not dusty and there left to cure.

The feathers may be used in making pillows, etc., for the home or may be sold to neighbors or to dealers.

If there are large quantities of feathers to be dried a special room should be provided for the purpose. The feathers spread on drying screens or frames covered with fine wire netting may be thoroughly dried and cured by means of steam heat.

The white feathers sell at the highest prices. On a large plant the feathers are expected to sell for a sum sufficient to pay for the killing and picking of the fowls.

Any feathers not used or sold should go into the compost heap.

BLOOD AND OFFAL:—In killing the fowls for the table or for market the blood should be saved. It is rich in nitrogen and may be used in a mash of meal, middlings, etc., to help balance the ration in the place of expensive beef scraps. If not used to feed the fowls it may at least be utilized as a fertilizer. It, together with the offal, may be mingled with dry soil, kept from wetness and used in the garden. If there is no other way of disposing of these parts they may be added to the compost heap.

The heads and shanks may be chopped fine or cooked and used to feed the fowls.

The empty egg shells should be dried, crushed and returned to the fowls.

DROPPINGS:—The excrement of fowls is too often neglected or wasted and sometimes becomes a source of danger to the health of the birds.

Poultry droppings if kept clear of all litter, soil, feathers, etc., and properly protected from wetness, can be sold to tanners in some localities, at a price that pays for the extra care taken to preserve them.

Suburban gardeners will oftentimes pay well for poultry manure that has been carefully kept from decomposing.

On a poultry farm where crops are grown the droppings should be carefully saved for use in the garden, orchard, tillage fields, or on the lawn or meadows.

Mingling dry loam with the droppings and protecting them from wetting will prevent the loss of their valuable nitrogenous elements. Wetting the excrement induces decomposition resulting in the formation of ammonia gas which, escaping, causes the loss of nitrogen and the fouling of the atmosphere of the hen house. Mingling lime or wood ashes with the moist droppings hastens their decomposition and should not be practiced.

The value of the fertilizing elements in poultry manure varies somewhat according to the food consumed and the products being made by the fowls. Growing chickens use much of the valuable constituents of the food in making flesh and bones and laying hens draw upon the important ingredients for making eggs. Mature stock and fattening fowls leave more of the valuable fertilizing ingredients to pass into the excrement.

The value of the manure of a mature fowl is estimated to average about fifteen cents yearly.

The following table states the average of several analyses of poultry droppings.

Fresh Manure of Fowls.

	Pounds in 100	Value
Water.....	57.00	
Nitrogen.....	1.15 @ 15c per lb.	\$.17
Phosphoric acid.....	.96 @ 7c per lb.	.07
Potash.....	.39 @ 4½c per lb.	.02

Poultry manure is specially valuable as a fertilizer for grass and forage crops, for Indian corn, cabbage, cucumbers, garden vegetables and fruit trees.

If bone meal or phosphate rock and wood ashes are also used for the crops the manuring is made complete.

THE COMPOST HEAP

In some convenient, secluded, well drained spot on the poultry plant a compost heap should be started. Several loads of loam are brought to the place and a foundation made by spreading the soil in a bed eight inches deep, four or five feet wide and eight or ten feet in length. The central portion may be slightly hollowed.

On this mellow loam can be thrown offal, bodies of fowls that die (if not of contagious disease), carcasses of any animals, wastes of the household not otherwise cared for, cleanings of sink drains, contents of cess pools and any vegetable refuse of the garden or farm. Whenever such materials are added to the compost heap loam is shovelled over the same to the depth of several inches. A pile of loam is kept at hand for this purpose.

If convenient the soapy water from the house laundry is poured upon the compost heap weekly.

If wood ashes are added to the heap decomposition will be hastened and an ample covering of loam should be kept upon the mass to absorb all odors and retain the fertilizing elements.

After a year or more the whole heap should be shovelled over from end to end. The mass will have be-

come thoroughly disintegrated and fitted for use as a top-dressing for grass land or for fertilizing the garden. Any substances not sufficiently decomposed can be thrown into the next compost heap. This is a simple, cleanly method of promptly and effectively disposing of things that might otherwise become offensive. It prevents wastes and saves fertilizing materials which will help to produce crops for feeding the fowls or for other purposes.

ECONOMY OF OPERATION

The poultryman who keeps accurate records of the amount of feed and labor involved in operating his poultry plant, is able after a time to figure very closely the cost of each of these items per egg produced, per pound of broiler, roaster or capon fitted for market, per pullet raised to laying age or per head of fowl for a year's keeping.

Comparing the cost with the price obtained or the income returned in any one of the lines of production, he has a basis for determining which branch of his business is most profitable and worthy of enlargement.

By means of his study of these problems of production he comes to realize that the ordinary methods of caring for poultry are not economical but exceedingly expensive.

The next step, naturally, is to endeavor to improve on the methods in use. Experiments are tried and new plans are tested. Economies are practiced which, while not lessening effectiveness, do reduce expenses.

Other poultrymen, hearing of the new methods test them under their conditions and perhaps modify them to some extent.

In this way progress in management has been accomplished which has made the poultry business increasingly profitable and satisfactory.

On numerous poultry plants the laborious lugging of water in buckets to supply the drinking fountains has given way to a system of piping which conducts

water by gravitation from an elevated source of supply to each pen or flock of fowls.

On some plants the carrying of feed in pails has been abandoned and a car running by a trolley conveys the supply of food from pen to pen of fowls. The mixing and feeding of wet mashers daily has given place, on more than a few farms, to the plan of feeding dry feed stuffs in hoppers which are filled once or twice a week.

Instead of opening and closing hen house doors hinged to open only one way the attendant pushes his way through doors hung on double hinges that close automatically.

The labor of attending the fowls is further reduced by keeping them in open-front houses. The scattering of fine grains in the straw litter is done from the outside of the house through the meshes of the wire netting covering the fronts of the pens. Hoppers placed in the front of the houses are supplied with feed stuffs, oyster shells, grit and granulated charcoal from the outside of the buildings. Next boxes placed at the front or rear of the house open to the outside for the removal of the eggs. Curtains for the front of the pens and for the roosting compartments are operated by cords running through pulleys to the outside of the house.

By building open-front houses twenty feet instead of ten feet wide it has been found practicable to place the yards at the rear of the buildings and leave the fronts free of fences so that in cleaning out the pens, renewing the litter and filling the hoppers convenient use may be made of wagons and horses.

By the colony plan of keeping fowls and growing chickens, yards are dispensed with, and the labor of feeding, collecting eggs, etc., is lightened by using horse power.

Sufficient study and thought applied to the problems of poultry management will always result in the saving of labor and the economizing of other expenses.

COMBINING CALLINGS

Increased economy and effectiveness in management are frequently gained by carrying on poultry keeping in combination with other occupations.

A small flock of fowls, fed mainly on the wastes of the household and cared for by some member of the family who can spare time for the work without neglect of regular duties, is kept at a small expense.

A dairy farm, selling cream or butter, has quantities of skim milk or butter-milk to be disposed of daily. Poultry will make good use of such by-products by converting them with other foods into saleable eggs and chickens.

Uniting poultry keeping with the culture of orchard fruits provides ideal conditions of range, shade, etc., for the fowls, which utilize some of the waste fruit and aid in subduing insect enemies of the trees.

Combining poultry culture with small fruit growing and gardening calls for the keeping of the chickens in yards or on ranges away from the growing and ripening crops at certain seasons but at times they help to dispose of the by-products or surplus crops and destroy many injurious insects.

In joining poultry keeping to bee culture there may be grown crops, such as peas, beans, buckwheat and clovers which will yield nectar for the bees by their blossoms, green foods and seeds for poultry food and hay or straw for littering the hen houses or feeding of the farm stock.

Poultry, when made a part of the live stock of the farm can utilize many of its crops and by-products to advantage.

If the farm is devoted mainly to poultry keeping the manager should consider carefully what crops he can grow to advantage and whether the cost of their production will allow of their successful selling in the market or more profitable use at home. In some cases the question will arise as to whether a crop useful for

feeding poultry can be grown more cheaply on the farm than it or a substitute can be bought on the market.

There will also be opportunity to decide as to the growing of such leguminous crops as field peas, cow peas, soya beans, clovers, alfalfa, etc., to take the place at least in part, of beef scraps or other expensive protein feed stuffs to be used in balancing the starchy grain feed stuffs.

The poultryman should consider the crops demanded by his available markets and how their culture will combine with poultry keeping.

He will further study their adaptations to his land, climate, the resources and equipment of his farm and his own capabilities in managing the culture of such crops in conjunction with poultry farming.

Where the flocks can have free range or yards of very large size it is desirable that a part of the land should be in grass, clover, alfalfa, growing grain or other crops suitable for supplying green food to the fowls.

If shade is not provided by trees, it should be furnished in mid-summer by crops or plants such as Indian corn, broom corn, sorghum, Kafir corn, sunflowers, hemp, castor beans, pole beans, asparagus, raspberry or blackberry bushes, grape vines, etc.

ROTATION OF CROPS AND POULTRY

Suggestions have already been given in Chapter IX for the rotation of crops in cultivating single, double and triple yards.

It is practicable to arrange a rotation of crops and poultry on the general farm.

The flocks are colonized on successive parts of the farm in rotation with the regular crops.

For the sake of illustration suppose the chief crops grown on the farm are grain, Indian corn, grass and clover and potatoes. Suppose further that the farm contains one hundred and fifty acres of land, ten acres being allowed for the farmstead, orchards, gardens and

woodland. The remaining area of one hundred and forty acres is divided into seven equal fields of twenty acres each, designated as Fields A, B, C, &c.

Following is a sample arrangement of the succession of crops and poultry for the different divisions of the farm during a course of seven years.

A SAMPLE SEVEN YEARS ROTATION

Years	Field A	Field B	Field C	Field D	Field E	Field F	Field G
First	Grass	Wheat	Corn	Potatoes	Poultry	Grass	Grass
Second	Grass	Grass	Wheat	Corn	Potatoes	Poultry	Grass
Third	Grass	Grass	Grass	Wheat	Corn	Potatoes	Poultry
Fourth	Poultry	Grass	Grass	Grass	Wheat	Corn	Potatoes
Fifth	Potatoes	Poultry	Grass	Grass	Grass	Wheat	Corn
Sixth	Corn	Potatoes	Poultry	Grass	Grass	Grass	Wheat
Seventh	Wheat	Corn	Potatoes	Poultry	Grass	Grass	Grass

This sample rotation is simply a form to show the method of managing the fields from year to year. In practice the arrangement is made to accommodate the

local conditions and the purpose and convenience of the manager.

At least one leguminous crop should be included in the course of the rotation. For instance, in the case just given, clover may be grown with the grass or in some localities alfalfa may take the place of the grass. After cropping grass three years in succession the poultry flocks are colonized upon the grass. If it suits the manager to grow less grass and more wheat or other grain he may crop two years' grass and grow two years' grain, sowing grass seed with the second sowing of grain. If more corn is wanted this crop may have two years of the seven in each field and grass or grain be left out one year. Instead of growing twenty acres of potatoes each year the manager may prefer to substitute root crops, cabbages and other vegetable crops for the potatoes or a part of them.

Using colony houses, each to accommodate fifty fowls and placing them about one hundred and fifty feet apart each way, forty houses on twenty acres, will provide for two thousand fowls.

The colony houses may be placed upon runners made of timber four inches by six inches placed edgewise under the sills and extending about one foot beyond the sides of the house. The projecting ends of the runners may be rounded underneath like sled runners so that they will slip forward readily over the ground.

Another plan is to place the houses upon axles supported by small thick wheels or a low truck may be used, each house being placed upon it, in turn, for moving to a new location.

If the climate should be so severe in winter as to prevent adopting the colonizing system in the fields throughout the year, the houses may be brought close together near the farmstead or where they will have the benefit of natural or artificial shelter and where it will be convenient to care for their inmates.

SPECIAL MANAGEMENT

This is decidedly an age of specializing in business.

The poultry industry readily lends itself to specialization.

While it may not be advisable to specialize too closely in this occupation it is oftentimes desirable to have one or two leading lines of production and manage the business so that everything shall contribute to the greatest success and profit of these specialties.

This plan may be undertaken after the poultryman by study and considerable practice, has acquired skill in general poultry management and has determined by experience what particular lines of poultry keeping are most promising of profit under his conditions.

By the concentration of means and effort upon the production of one or two specialties there should result great improvement in quality and increase in quantity of production.

An especially fine product offered in considerable quantity and supplied regularly will usually insure prompt sales at remunerative prices.

AN EGG FARM

A favorite specialty of poultry keepers is egg production for market.

In a locality where the climatic conditions and absence of enemies permit the fowls to live on free range throughout the year, the colony plan of management may be followed. If the poultryman prefers not to raise his laying stock he can purchase well grown pullets each fall. These may be disposed of alive or as dressed fowl at the end of the laying season or before next year's supply of pullets is purchased. Another plan is to keep the fowls through two laying seasons, purchasing pullets yearly for the renewal of half the flocks.

The egg-producers are kept, without male birds, in flocks of thirty to sixty head in portable houses.

A horse or pair of horses and wagon are used in carrying feed supplies, collecting eggs, etc.

The labor expense in caring for the scattered flocks is somewhat large but if drinking water is constantly

supplied by natural streams or by a system of piping and the feed is principally furnished in large hoppers the necessary work is minimized.

If the poultryman prefers to raise his laying stock he uses the eggs of his best stock laid during the second year. He must of course have a suitable equipment of incubators and brooder houses.

In conducting an egg farm in a location having a severe winter climate another method may be followed. Long houses, about twenty feet wide, the fronts partly open have been very successfully used by the poultry specialists of the Maine Experiment Station. The pens may be twenty feet wide, separated by partitions of boards or canvas. One open space is provided for each pen front, extending down from the plate two and one-half or three feet and along the front about ten feet.

A curtain or frame of burlap or duck is provided for protecting the open space in case of storm that would drive rain or snow into the house. Another frame covered with cloth is hinged at the top in front of the roosting place, which is in the back part of the pen. In very severe weather the frame is let down to protect the fowls upon the perches.

The yards for summer use are arranged at the rear of the long laying houses. The fowls are kept in the houses during the winter. Dry straw is used to litter the floors and feeding is mainly done by means of large hoppers.

There is a door in the front of each pen and a platform walk runs the length of the house at the front, on the outside.

Horses and wagons can be driven close to the front of the houses in cleaning out the pens and bringing fresh supplies of litter.

Doors on double hinges connect from pen to pen through the middle of the house and feed supplies are conveyed by a car running upon an overhead trolley. Flocks of Plymouth Rock fowls have laid better during

winter in such houses than in houses with closed fronts and glass windows.

HATCHING CHICKS TO SELL

When a poultryman becomes very skilful and successful in the operating of incubators and is located where he can easily send newly hatched chicks to customers it is possible to develop a profitable trade in this line during a portion of the year.

There are many people who wish to keep poultry but have not the facilities, the time, the inclination or perhaps the experience necessary to properly hatch chicks for themselves. Such persons will gladly pay a good price for the chicks nicely hatched and safely delivered to them.

Chicks of one or two days old are readily sent by express or otherwise, even long distances.

The expert incubator operator who hatches healthy, lively chicks of a desirable standard breed of fowls and guarantees safe arrival of the chicks at their destination should find this specialty remunerative.

BROILERS FOR MARKET

The poultryman who is expert in both hatching and brooding chicks, has a plant well equipped for both operations and is located within easy reach of a large city may find it advantageous to produce broilers.

Squab broilers, so called, are much in demand to supply high class hotels, restaurants and club houses in the winter time.

These chicks are kept in brooder houses and forced to rapid growth for eight to ten weeks and marketed weighing one and one-half to two pounds to the pair, at good prices.

The American varieties of pure bred poultry produce excellent broiler chicks. The poultryman should possess a good strain of winter layers so as to have a certain supply of good eggs for hatching from November to February.

The chicks are kept in rather restricted quarters and fed all the food they can utilize without endangering health. A pen six feet by three feet will accommodate thirty chicks nicely during their two months of growth.

Chaff or cut hay litter is scattered in the runs and the chicks are managed practically the same as brooder chicks that are to be grown to maturity.

This branch of poultry keeping may readily be added to the regular business because it is conducted in the winter season and without great increase in expense for labor.

Following this season there is a demand for spring broilers which continues through the spring and summer even into the autumn. These chicks are grown until they weigh one and one-half to two pounds apiece.

Frequently the poultryman prefers to raise his pullet chicks to maturity but disposes of the cockerels as

SOFT ROASTERS AND CAPONS

A good business may be done by hatching chicks late in the summer, brooding in autumn, growing through the winter and selling them as plump roasters in spring.

Good eggs for hatching are liable to be somewhat scarce in the fall, incubating is more uncertain than in the spring and brooding during the months preceding winter has its difficulties but with suitable equipment and good management the obstacles can all be overcome and very satisfactory sales made in spring when there is practically no competition in the market for this class of goods.

The cockerel chicks are caponized at about three months age and these with the plump pullets taken when about ready to lay, make the finest of soft roasters. The prices obtained for these birds in city markets are usually very satisfactory.

Light Brahmas and White Plymouth Rocks are favorite varieties of fowl for this kind of poultry farming.

Cheap colony houses are used by some poultry farmers who follow this line of production.

The brooder houses of poultry farms where this business is pursued year after year, are carefully cleaned out early in summer or before summer begins and left open to the sunshine and circulation of fresh air for several months to keep the quarters healthy and free from all injurious germs.

During the winter months the birds are fed from hoppers mainly but some small grain may be scattered daily in the straw litter covering the floors of the houses.

Indian corn and beef scraps are the chief feed stuffs used in the rations balanced for growth.

The capons and pullets are quiet fowls, live and thrive in rather close quarters and make first class roasters.

SPECIALTY BREEDING

The finest work and study in poultry culture is done by men and women who devote their energies to improving pure breeds or developing improved varieties of poultry.

There are abundant opportunities for the choice of a special line of this work.

One may breed for fine quality with the purpose to sell breeding stock excelling in egg production, flesh growth, fine plumage, symmetrical form, beautiful appendages or any other desirable characteristic.

There is a large field for enthusiastic endeavor in the breeding of the diminutive bantam varieties of poultry.

Whatever line of poultry culture is chosen, success in specialization will depend largely upon the earnest, effective personal attention given to its management by the poultryman.

Intense study and skilful management must win excellent results for the poultry keeper whose character exemplifies the truth of the words,

"Gentleness is Strength Under Control."



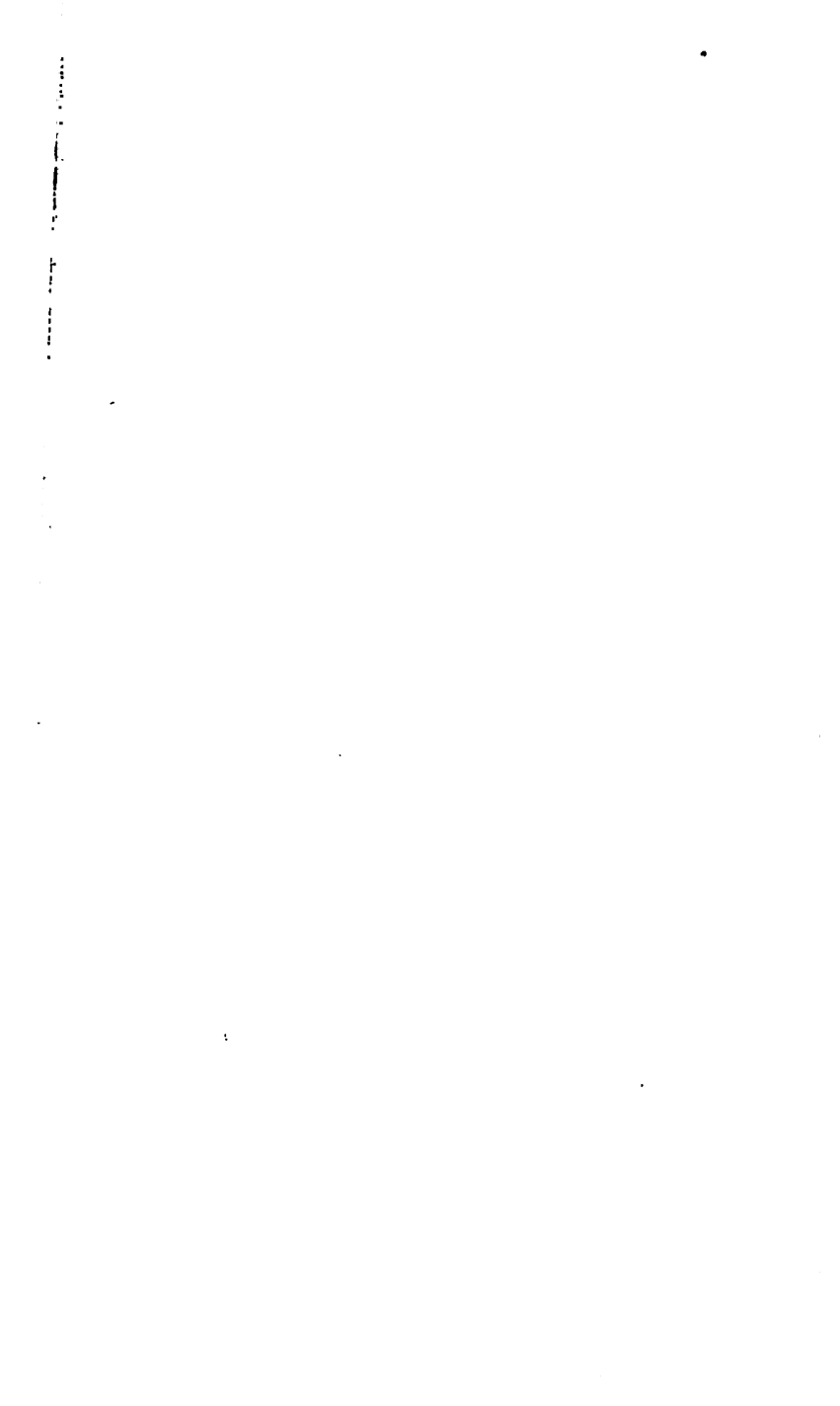
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